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DELIRIUM TREMENS*

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THE diagnosis and treatment of delirium tremens are usually considered to lie entirely within the province of the psychiatrist; yet the responsibility for the immediate therapy of the condition frequently falls on the general practitioner or internist. To the psychiatrist delirium tremens is an acute toxic psychosis precipitated by prolonged and excessive drinking of alcoholic beverages by persons who perhaps already possess more or less serious psychiatric abnormalities. To the present-day internist it is essentially a problem in sedation, rehydration and vitamin-replacement therapy, whereas to the chronic alcoholic patient it is a terrifying and sometimes fatal hallucinatory illness. Thus, although the nature of delirium tremens and its long-term therapy are essentially psychiatric problems, a practical knowledge of the disorder and its treatment definitely merits the attention of the internist.

DEFINITION AND DIAGNOSIS

In defining delirium tremens, one can hardly do better than consider the layman's expressive term for the disease, namely, "the shakes and the horrors." Practically, the fully developed condition involves several elements, including chronic alcoholism, nervousness, sleeplessness and tremors, and visual hallucinations, occasionally accompanied by other types of hallucinatory experiences. Clinically, one must recognize the incipient as well as the active phase of the disease. In the incipient stage, only tremors and apprehension are noted. With the addition of hallucinations, full-blown delirium tremens is present. Experienced chronic alcoholic addicts are fully cognizant of the incipient phase, "the shakes," and often seek hospitalization soon after its onset in the hope that they can, by means of medical attention, avoid "the horrors." If proper therapy is instituted at this time, the physician is frequently able to spare the alcoholic patient the truly frightful experience of fully developed delirium tremens. Furthermore, whereas fatalities among the incipient or prodromal group are rare, the same cannot be said for the full-blown condition.

There are several other types of alcoholic psychoses that may easily be confused with delirium tremens. The interesting and excessively rare condition known as alcoholic hallucinosis usually occurs in a younger age group than does delirium tremens, is associated with auditory hallucinations and not generally with visual hallucinations, and is remarkable in that characteristically the patient's insight into his condition is extremely clear. According to Bleuler,[1] such patients are deeply impressed by the content of their auditory hallucinations but paradoxically often recognize them as false sensory perceptions. Only 1 patient with what appeared to be pure alcoholic hallucinosis was admitted to the Second and Fourth Medical Services of the Boston City Hospital during 1941. Delirium tremens may apparently be superimposed on Korsakow's psychosis, but diagnosis of the latter must await clearing of the delirium.

"Rum fits," perhaps better known as "alcoholic epilepsy," are often associated with active delirium tremens but are probably not a manifestation of that condition per se. Finally, various complex and undiagnosable combinations of the alcoholic psychoses are occasionally seen. Such terms as "alcoholic deterioration" or simply "alcoholic psychosis" are not infrequently employed for discharge diagnoses of these cases.

GENERAL INCIDENCE AND MORTALITY

Accurate statistical information on delirium tremens is difficult to obtain. Moore and Gray's[2] report indicated that 6.2 per cent of the 38,376 patients admitted to the Boston City Hospital for alcoholism in the twenty-year period ending in 1935 had delirium tremens. In the six-year period, from 1936 to 1941, following this report, there were 14,276 admissions for alcoholism to the same hospital, and of these patients 2985, or approximately 21 per cent, were diagnosed as having delirium tremens.

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All these figures are, however, based on discharge diagnoses made by a great many different staff members, and include incipient as well as active cases of delirium tremens. The 1941 figures for the Second and Fourth Medical Services at the Boston City Hospital, based on a personal survey of the case records, appear in Table 1.

TABLE 1. *Incidence and Crude Death Rates for Patients with Delirium Tremens on the Second and Fourth Medical Services of the Boston City Hospital in 1941.*

DIAGNOSIS	NO. OF CASES	NO. OF DEATHS	MORTALITY %
Alcoholism	575	-	-
Delirium Tremens	185	9	4.8 (±1.4)
Incipient	121	0	0
Active	64	9	14.0 (±4.4)

A summary of crude death rates for delirium tremens in the literature appears in Table 2. Examination of such data discloses several factors of interest. Moore's[4] figure is actually an average mortality rate for a twenty-one-year period. The rate for the first year of this period reached the astounding peak of 52 per cent, whereas that for the last year was 14 per cent. Such an average value thus gives little indication of the current mortality. The studies of Rosenbaum et al.[7] do not include cases having serious complications such as trauma and pneumonia, and their death rate is based on cases of active delirium tremens only. In Table 1, death rates for active delirium tremens and for the total group are given, the latter figure, 4.8 per cent, being roughly comparable with Moore's figure of 14 per cent. No attempt was made to rule out the cases in our series that were complicated by serious illness other than delirium tremens.

TABLE 2. *Crude Death Rates for Patients with Delirium Tremens, as Reported in the Literature.*

AUTHORITY	YEAR	DEATH RATE %
Ranson and Scott[3]	1911	37.0
Moore and Gray[4]	1915–1935	24.0
Bowman et al.[5]:		
First period	1939	16.0
Second period	1939	4.6
Piker and Cohn[6]	1937	5.3
Rosenbaum et al.[7]	1940	1.3

AGE, SEX AND RACE INCIDENCE

Active delirium tremens is most frequent between the ages of forty and fifty.[8] In this series the peak incidence occurred between the ages of thirty and fifty, as shown in Table 3. It may be inferred from the figures in this table that delirium tremens does not develop until constant and heavy alcoholic indulgence has extended over many years. Close consideration, however, indicates that the peak incidence for chronic alcoholism, as reported by Moore,[2] coincides with that for delirium tremens, so that conclusions from such figures as regards the length of time required for the development of delirium tremens cannot logically be drawn.

Most studies indicate that active delirium tremens occurs far more frequently in men than in women, and the present series, in which only 4 patients were women, is in agreement. This difference is, however, probably less pronounced than it appears, since female alcoholic patients are much more likely to be treated at home than on the wards of a public hospital.

TABLE 3. *Age Incidence in Cases of Active Delirium Tremens Admitted to the Second and Fourth Medical Services of the Boston City Hospital in 1941.*

AGE GROUP yr.	NO. OF CASES	PERCENTAGE
20–29	4	6
30–39	20	31
40–49	27	42
50–59	9	14
60–69	4	6
Total	64	

It is striking that of the 62 patients with active delirium tremens none were Jewish, in spite of the fact that about 10 per cent of all patients admitted to the hospital are Jewish. The extremely low incidence of delirium tremens among Jews was commented on by Kat et al.,[9] who found none in their series of 132 cases seen at the Neuropsychiatric Clinic of the University of Amsterdam, a city having a large Jewish population.

PRECIPITATING FACTORS

Chronic alcoholism, as well as gross malnutrition, is intimately associated with delirium tremens. Various concepts and definitions of chronic alcoholism and abnormal drinking have been tabulated by Bowman and Jellinek.[10] It is probably not far from the truth to say that the chronic alcoholic addict is one to whom drinking is life's sole essential activity. In Peabody's[11] words, "Normal drinkers are those to whom a night's sleep represents the end of an alcoholic occasion; chronic alcoholics are those to whom a night's sleep is only an unusually long period of abstinence." It is important to note that the emphasis placed on the procuring and partaking of alcoholic beverages by the chronic alcoholic addict often precludes normal activity of any kind. Partial or total abstinence from food concomitant with or as a result of chronic alcoholism is the rule. Practically all observers are agreed that trauma and acute infection frequently precipitate active delirium tremens in chronic alcoholic patients. Some 30 per cent of our cases were complicated by serious infection, including lobar pneumonia and bronchopneumonia, pneumococcal meningitis and, in 1 case, miliary tuberculosis. Cases complicated by trauma are admitted to the surgical services and are seldom seen on the medical wards. As a com-

plicating factor in already serious disease, delirium tremens must certainly contribute heavily to the mortality in such cases.

Table 4 shows clearly the effect of delirium tremens on pneumonia mortality, as reported by Tilghman and Finland.[12] On statistical examination, the differences in mortality between the group of uncomplicated cases of pneumonia and that of cases

TABLE 4. *The Effect of Delirium Tremens on Mortality from Pneumococcal Pneumonia.**

DIAGNOSIS	MORTALITY	
	ALL CASES	BACTEREMIC CASES
Uncomplicated pneumococcal pneumonia	39.8 % (±1.6)	79.0 % (±2.3)
Pneumococcal pneumonia complicated by delirium tremens	71.0 (±7.3)	100.0 (±8.8)

*The figures are those of Tilghman and Finland[12]; no case received either serum or a sulfonamide.

complicated by delirium tremens appear to be fully valid. Although no exact information concerning the age distribution of the cases of pneumonia complicated by delirium tremens was available, the data remained significant when generous allowance was made for this important factor.

CLINICAL FEATURES

In all these cases of delirium tremens, there first occurred a bout of relatively heavy drinking and inadequate food intake, usually lasting from two to six weeks. Rarely the history of such a debauch was withheld by the patient, but in most cases no attempt at concealment was made, although the amounts of liquor consumed were often grossly understated. Early morning drinking is suggestive, since it is well known that persons who drink on arising in the morning frequently do so to calm a shaky hand. The actual amounts of alcoholic beverage consumed vary from a pint to several quarts of various types of liquor. The interrogator should accept with skepticism the statements of a chronic alcoholic addict about his drinking habits, and a negative alcoholic history never rules out delirium tremens as a possibility.

The so-called "prodromal features," such as apprehension, tremors and particularly sleeplessness, are usually considered to indicate incipient delirium tremens. Few cases of active delirium tremens fail to pass through this stage, although the history of it may not be forthcoming. Most patients are chiefly concerned with their inability to sleep, and for this reason many chronic alcoholic addicts become habituated to barbiturates. Apprehension usually develops when the patient realizes that he is about to develop "the horrors," particularly if he has been through the experience before. It is this feature that may send him to a hospital, pleading for admission, in the hope that he will escape the hallucinatory phase of his disease. It is of interest to note that the experienced chronic alcoholic patient often undertakes some therapeutic measure at this point. He may, and frequently does, increase his alcoholic intake prodigiously in an effort to "quiet his nerves." Self-medication with paraldehyde is an increasingly frequent occurrence. The fact that the drug is used in hospital practice as an effective sedative in delirium tremens, in addition to the fact that it is procurable in most localities without a physician's prescription, is largely responsible for its increasing popularity among chronic alcoholic patients. Many of our patients with active delirium tremens smell strongly of paraldehyde on admission.

The transition from incipient to active delirium tremens is usually gradual unless precipitated by trauma or severe infection. Mental confusion and disorientation often precede actual hallucinations. Usually, short but vivid visual hallucinations appear first at night. Within the next few hours, the hallucinations may become more frequent and more intense until finally the patient is actively and often dangerously delirious. His response to the hallucinations seems to depend to a large extent on their nature and on his emotional and physical make-up. In general, his actions are obviously motivated by terror, and this fact can hardly be overemphasized. Visual hallucinations are the rule; in addition, auditory hallucinations are frequently but not always present. The objects seen are generally tiny and innumerable, and often direct their threatening activities against the patient himself. The misinterpretation of spots on the bedclothes, leading to plucking movements, is justly considered a classic symptom of active delirium tremens. Snakes, alligators, dogs and other animals frequently figure in the hallucinatory experiences of delirium tremens patients. Some patients complain of countless tiny human forms dancing about the room. A recent patient complained that millions of tiny Japanese soldiers were marching across the floor, up the wall and onto the ceiling in order finally to drop on the bed. Some victims refuse to divulge the nature of their hallucinations, dismissing them as "unmentionable." One female alcoholic patient complained of sleeplessness because she was constantly seeing innumerable cash-register keys and hearing them scream the prices of liquors and cheap wines.

Generally, the hallucinatory phase runs its course in two to four days, although tremors may remain as long as two weeks. If the disease is complicated by serious infection, there may be repeated bouts of hallucinations separated by several days of calm. On recovery from active delirium tremens most alcoholic patients make solemn promises never to indulge again, and at this point they are most susceptible to psychotherapy.

Physical examination in the incipient stage invariably discloses a tremulous, apprehensive person, usually begging for sedation and often smelling of alcohol or, less frequently, of paraldehyde. De-

hydration, marked by a dry, furrowed tongue and loose, flabby skin, is the rule. The reflexes are often hyperactive. Tremors are best seen in the extruded tongue or in the outstretched hands. Gross generalized somatic tremors may be indicative of a shaking chill, pointing in turn to a complicating infection. Careful examination of the lungs, heart and central nervous system should not be omitted in view of the high frequency of complicating infection or trauma. Generally examination of the abdomen reveals nothing abnormal, but occasionally a rigid and extremely tender abdomen is seen. This condition, known in hospital parlance as the "rum belly," may suggest a perforated viscus with generalized peritonitis, intestinal obstruction or almost any acute abdominal catastrophe. It is variously attributed to acute alcoholic gastritis or to acute pancreatitis, but its true nature is not understood.

Laboratory data indicating dehydration of moderate and occasionally of severe degree are found in the majority of cases. Significant elevations of urinary specific gravity, hemoglobin, white-cell counts and nonprotein nitrogen values are frequently observed. Prompt return of these values to normal occurs in most uncomplicated cases on the administration of fluids.

Therapy

Until comparatively recent times, patients suffering from delirium tremens were usually subjected to no particular treatment other than a jail cell and more or less brutal treatment from unenlightened attendants. The mortality resulting from such treatment will never be known, but it must have been appallingly high. With the introduction of more sympathetic therapeutic measures, the mortality appears to have declined. There remains, unfortunately, much folklore and superstition in connection with the disease in the minds both of the public and of physicians. Some of these concepts are harmless, but some are probably dangerous and should be forthwith abandoned.

Alcohol

A practice still prevalent in Europe is treatment of delirium tremens with alcohol because the condition is allegedly precipitated by abstinence. According to Sheps,[13] some French clinicians administer alcohol by vein if the patient cannot take it by mouth. One of the most powerful arguments against such therapy is the observation of Piker[14] that from 75 to 90 per cent of patients have delirium tremens while still drinking. Many of the patients with active delirium tremens smell of alcohol on entry, having attempted to ward off this condition by heavier and heavier drinking. Sheps[13] treated 104 chronic alcoholic patients showing evidence of incipient delirium tremens with hydrotherapy, sedatives and nutritional measures. No alcohol was allowed, yet no case developed active delirium tremens. In the words of Bowman et al.,[5] "the administration of alcohol, therefore, either to prevent delirium tremens or as a subsequent therapeutic measure, has no basis in fact, and furthermore often presents an unsurmountable psychologic barrier in the further treatment of such patients."

Spinal Drainage

Therapeutic spinal drainage in delirium tremens was first recommended by Steinebach[15] in Germany, and was subsequently advocated by Hoppe[16] in this country, apparently because of a supposed increase in cerebrospinal fluid pressure. More recently, Piker and Cohn[6] attributed their excellent results in delirium tremens therapy in part to spinal drainage. They assumed that there is an irritation and edema of the brain and meninges and an increase in intracranial pressure. Some doubt was cast on this assumption by Rosenbaum,[17] who after performing lumbar punctures in 234 cases of active delirium tremens concluded that 75 per cent of the patients had normal cerebrospinal-fluid pressures. He made the pertinent observation that it is difficult, under the best of circumstances, to achieve sufficient relaxation for accurate pressure readings in patients suffering from delirium tremens, and suggested that in fact even more than 75 per cent of the patients have normal cerebrospinal fluid pressures. Merritt et al.[18] obtained similar results in examining 201 cases of acute alcoholism, including some cases of delirium tremens.

The finding of the so-called "wet brain" at autopsies in patients dying of delirium tremens is the subject of spirited controversy among neuropathologists, and the relation of such a finding to the disease appears to be in doubt. One is, therefore, forced to conclude that spinal drainage has no rational basis in the therapy of the condition. That the measure does not actually alter the clinical course has been established by Rosenbaum, Piker and Lederer.[7] In carefully controlled clinical experiments, neither spinal drainage nor dehydration measures were found to alter the mortality or clinical course of the disease.

Fluid Therapy

Only comparatively recently has the liberal use of fluids in the treatment of delirium tremens been widely recommended. Piker,[19] who in 1937 recommended spinal drainage and dehydration, reexamined the evidence in 1938. In extensive clinical trials, he was unable to establish the usefulness of fluid limitation and concluded by recommending that fluids be neither limited nor forced. He continued, however, to recommend control of cerebral edema by the judicious use of dehydrants. Bowman, Wortis and Keiser[5] in 1939 took note of the dehydration exhibited in almost all cases of delirium tremens and recommended full hydration with 3000 to 4000 cc. of fluid per day. They observed

that the fluid itself may act as a sedative and that further medication may be unnecessary. Spinal drainage, as well as the use of dehydrating agents, has no place in their therapeutic regime. Wortis,[20] in an excellent general review of the subject, states the view that dehydration and spinal drainage are useless and that hydration is a logical and valuable adjunct. Laboratory support for these views is supplied by Cohn,[21] who found that the blood chloride and carbon dioxide-combining power values were almost always low in delirium tremens, whereas the hemoglobin, serum protein and hematocrit values were increased. He logically concluded that the condition should be treated by restoration of fluid and salt to the body.

It therefore seems unwise and illogical to limit fluids and administer dehydrating agents in a condition of which one of the most constant features is dehydration. In addition, such limitation may conceivably be dangerous, particularly in cases complicated by infection.

Sedation

Sedative medication is almost always necessary in treating delirium tremens, and sedation is often difficult to achieve. The older literature contains recommendations for almost all the known sedatives. The one drug that is almost universally recommended is paraldehyde. Most modern writers[5, 6] agree that this drug is the most innocuous, the most rapidly eliminated and the most uniformly effective of all sedative medicaments in the treatment of delirium. On the other hand, Henderson and Gillespie[22] state that paraldehyde may actually increase the degree of delirium. Sperber[23] holds the same view and states that patients may be literally saturated with the drug and still be actively delirious. Apparent confirmation of this view will have been observed by almost everyone who has had experience in the therapy of delirium tremens. Romano[24] offers a plausible explanation for this apparent paradox as follows:

> Any chemical sedative, including paraldehyde, if given in fragmentary doses or to individuals who have had other chemical sedatives, may enhance delirium. However, if a patient enters the hospital in incipient delirium tremens and an adequate amount of paraldehyde is given to ensure sleep, it does not provoke the delirium. Certain incipiently delirious patients find themselves on the ascending limb of a delirium and at times paraldehyde is ineffective in checking the course of the delirium.

In other words, adequate doses of paraldehyde will control most cases of active delirium tremens but inadequate doses may well be worse then useless. The initial oral dose recommended by Goodman and Gilman[25] is 3 to 8 cc., increased to 10 or 15 cc. if necessary. At the Boston City Hospital, it has been found that single oral doses of less than 8 cc. are of little use in controlling patients with active delirium tremens and that larger initial doses are indicated. It is highly desirable, as stated by Piker and Cohn,[6] in all cases of delirium tremens to induce sleep as soon as possible. A rational program to this end is to administer an initial oral dose of up to 16 cc., followed as necessary by oral doses of 8 to 12 cc. every hour. If other measures are adequate, the usual case can be controlled on this regime in two to three hours or less. If the oral route of administration is impossible or impractical paraldehyde can safely be given intramuscularly in doses up to 10 cc. Rectal administration of paraldehyde to actively delirious patients has proved difficult and often impossible in our hands. That the intravenous use of paraldehyde in therapeutic doses may be dangerous is indicated in a recent report.[26] Finally, habituation to paraldehyde is not rare, particularly among chronic alcoholic patients who have had repeated bouts of delirium tremens. The drug is actually used as an acceptable substitute for alcohol by some such patients. These facts do not by any means contraindicate the use of paraldehyde in the treatment of active delirium tremens, but when the active phase of the disease is relieved, it is wise to abandon sedatives if possible, or to substitute small doses of barbiturates for paraldehyde if some sedative measure continues to be required.

Barbiturates have been employed much less freely in treatment of delirium tremens than has paraldehyde. One objection is that such large amounts are required that the fatal dose may be approached. Nevertheless, if other measures are adequate, many cases of incipient delirium tremens respond very well to frequent subcutaneous injections of luminal sodium in 3-gr. to 5-gr. doses. The drug is obviously useless in the treatment of active delirium. Sperber,[23] however, used intravenous Evipal Sodium (2 cc. of a 10 per cent solution) to good effect in 3 wildly delirious patients. It should not be forgotten that barbiturates given intravenously may cause serious damage to the liver, particularly in alcoholic patients. Nevertheless, Sperber's suggestion has been followed by us to good advantage in a few particularly violent and obstinate cases. The method is particularly useful in quieting patients who have developed active delirium tremens postoperatively or following severe trauma. In such cases operative wounds may be torn open or further trauma may be inflicted unless the delirium is quickly controlled. The judicious use of barbiturates given intravenously appears fully justified under such circumstances. Morphine has been outlawed in delirium tremens therapy for years, largely because it is said to produce or enhance cerebral edema. Certainly there is nothing to be said in favor of its use in this condition. Apomorphine and strychnine are recommended by Lambert[8] for severe cases of delirium tremens but are not included in more modern therapeutic

regimens. Scopolamine has been largely abandoned in routine therapy because of the uncertainty of its effect.

Vitamin and Dietary Therapy

Since the introduction of thiamine and nicotinic acid into general use, many reports have appeared purporting to show that they are curative in cases of delirium tremens. Suffice it to say that no report of dramatic success with these agents is convincing. Rapid cures in cases of delirium tremens treated with thiamine have been reported by Kiene et al.,[27] Cannon et al.,[28] who gave thiamine along with glucose and insulin, and Sciclounoff and Flagg.[29] It was Hammargren's[30] opinion that thiamine therapy in delirium tremens is sufficiently promising to warrant further investigation. Rosenbaum, Piker and Lederer,[7] in controlled clinical observations on 36 cases of delirium tremens, found that the patients treated with thiamine required less paraldehyde than did the untreated groups. Nevertheless, they observed that two patients who had incipient delirium tremens on entry developed active delirium tremens after forty-eight hours in spite of large doses of thiamine. Jolliffe et al.[31, 32] found that nicotinic acid produced dramatic cure in certain cases of alcoholic delirium that they distinguish from delirium tremens as "nicotinic acid deficiency encephalopathy." They point out, however, that in delirium tremens per se they do not consider thiamine or nicotinic acid deficiencies to be etiologically specific, nor do they consider these substances to be curative when used therapeutically. Thus one is forced to agree with Rosenbaum, Piker and Lederer[7] that, once the disease starts, the addition of thiamine, nicotinic acid, liver extract and brewer's yeast does not aid in shortening the illness.

Nevertheless, to withhold generous quantities of vitamins from patients with delirium tremens appears to be shortsighted and academic. It is a matter of common experience that the patients are badly nourished and subject to gross avitaminoses. For this reason it seems desirable as suggested by Jolliffe et al.,[32] to correct faulty vitamin intakes in these patients, although dramatic curative results are not to be expected.

It is extremely important to restore patients who have had delirium tremens to adequate dietary intakes as soon as possible. In unco-operative patients, the administration of large quantities of semi-fluid food rich in carbohydrate and protein by stomach tube is of value. Such mixtures should preferably be divided into small amounts, to be given at frequent intervals.

Miscellaneous Measures

Few writers in recent years have failed to condemn the use of restraint in handling delirious patients, although some authorities recognize it as a necessary evil in situations in which nursing care is limited. It should be emphasized that the inexperienced physician is apt to attempt to do with restraint what he has failed to achieve with sedatives and judicious handling of the patient.

Continuous tub baths for the afebrile or slightly febrile delirium tremens patient are recommended, and are used in some clinics with excellent results. This type of therapy is rational and doubtless reduces considerably the amount of sedative medication needed in a given case, but it also requires more facilities and man power than are available in the average public hospital.

Ideally, close attention should be paid to the surroundings in which a delirious patient is put. It is often bad practice to leave such patients in darkness, since this seems to increase the terrifying effect of hallucinations. Preferably lighting should be subdued but should extend to every corner of the room. Pictures on the wall are apt to provide the patient with further material for hallucinatory processes. Of extreme importance is the fact that the suicidal or homicidal tendencies of some delirious patients make the leaving of glassware and other loose objects in the room distinctly unwise.

Psychotherapy is of undoubted value in many cases of delirium tremens but is beyond the scope of this paper. In assaying the results of treatment, which is often directed at actual cure of chronic alcoholism, it should not be forgotten that a single bout of full-blown "horrors" is sometimes followed by a prolonged period of abstinence, regardless of the therapy employed. In rare cases, a vigorous bout of delirium tremens may afford sufficient impetus to induce a patient to give up drink altogether.

* * *

In conclusion, although significant advances have been made in the therapy of delirium tremens, the number of deaths still appears to be unnecessarily high, particularly among cases complicated by infection or trauma. Obviously, treatment of complicating illness is of the utmost importance. Nevertheless, prompt control of delirium tremens itself is essential, since proper treatment of the complicating illness is generally impossible until the delirium is controlled or subsides. The mortality among the uncomplicated cases is low and, with regard to this group of patients, one can agree with the conclusion of Rosenbaum et al. that "the problem in delirium tremens at this time is not so much one of discovering the proper method of therapy as it is an elucidation of the etiologic factors involved."

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THE WAR AND PUBLIC HEALTH

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THE military aspects of public health are many and varied. It is obvious that a healthy army and navy can be recruited only from a healthy population, and one may say without exaggeration that the public health of our nation furnishes the basis on which can be estimated the man power for the armed forces and for the war-production industries.

During the present war it has often been wondered why the Italian troops were not better warriors and why their campaigns have not been more successful. Without knowing the reasons for the Italian failures, one may strongly suspect that the principal one has to do with public health in Italy. The Italian health services have never been particularly distinguished in spite of the fact that a few eminent men have held posts in them. A large part of the nation has for endless years been exposed to malaria of a particularly pernicious kind. Experience with the disease has demonstrated that chronic and repeated infections with malaria in endemic areas, such as southern and central Italy, produce a weakened population; not only is the health of the communities at a low level but also the economic condition of the people is depressed. Much of the southern Italian population is involved in a vicious circle of disease, undernutrition, poor economic status, poor education and, worst of all, a low state of morale and a hopeless outlook for the future. With better public health in Italy the whole course of the Italian war efforts might have been quite different. There is nothing new about this idea, for the decadence of classical Greece has been almost universally attributed to the invasion of the country by malaria at about the fifth century before Christ. The Greeks in their day could do nothing about this because no one had the necessary knowledge, but this is not true today. Malaria is now well understood, and if the Italians had used the available knowledge of the disease they could in all probability have controlled the greater part of it, just as has been done in this country.

Every activity of a state health department is important to the military services. Even the maternity and infant welfare divisions become fundamentally significant when we find it is obligatory to recruit eight or ten million young men and to enlist under a voluntary system large numbers of young women, and to continue these activities over an indefinite period of years. Everyone hopes that the duration of the war will be short, but the country must nevertheless prepare for a long war or run the risk of losing everything through inadequate preparation. If the states had had better divisions of maternity care and infant welfare during the last twenty years, it might not have been necessary to reject so many young people for disease of one sort or another during the present global war.

In the early days of conscription, before the Nation's actual entry into the war, the number of rejections at recruiting stations was, according to the reports of the selective service boards, about 500 men out of every 1000 examined. The majority of rejections were made because of disease or physical defects, but mental diseases of varying severity accounted for a considerable number. In the early

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days of the draft, about 35 men per 1000 were rejected for the latter reason, but later, when the Surgeon General had called special attention to the seriousness of abnormal mental states, the number of rejections increased to about 80 per 1000.

Another cause of rejection at the induction centers that shows an increasing rate is pulmonary tuberculosis. Although the plans of the Army and Navy called for physical examination, including x-ray examination of the chest, of all draftees, it was not possible in the early days of the war to obtain a sufficient number of x-ray machines to do the work. When, however, an adequate number of outfits became available, the rejection rate on account of pulmonary tuberculosis rose from 8 per 1000 in March, 1941, to 16 in January, 1942, and the rate continued to rise to 18 in September, 1942. This does not, of course, mean that the disease is increasing at this rate in the civil population, but merely that improved methods of diagnosis are giving a truer picture of the prevalence of pulmonary tuberculosis than has ever been obtained by the earlier methods. It also demonstrates quite clearly the need for universal x-ray examination of the chest in all properly conducted physical examinations, in civil life as well as in the armed forces.

Rejections because of cardiovascular disease, largely the results of rheumatic fever and of syphilis, amount to about 50 men per 1000. This high rate indicates clearly one of the important fields of study for the future. Cardiovascular disease due to syphilis is surely preventable and as such is of prime importance to all health authorities. In every war an increase in syphilis is to be expected; there will probably be an increase in this one, and the health authorities must make provision for it. Fairly good methods for the control of syphilis are available, and the Scandinavian countries, for example, have been highly successful in applying them. This country has lagged behind and is now faced with a problem of increasing size, so that it is important for health departments to overhaul their venereal-disease programs and make provision for extending and improving them.

Syphilis is a world-wide disease, but its virulence varies considerably in different parts of the world. It is well known that the syphilis of the Caribbean is mild, and it is for this reason that the theory of the American origin of syphilis has always struck me as sound. In the Orient, however, the disease is quite virulent. The syphilis in this country lies between the two extremes: that is, it is moderately severe. So far as is known, both the virulent and the mild forms respond well to the modern treatment that is now available.

Another venereal disease for which we must be on the lookout is lymphogranuloma venereum, which to most practitioners in this latitude is a new disease. It is of common occurrence in the tropics and particularly so in the Caribbean area. Cases are not infrequent in Puerto Rico, Cuba and Central America. The disease has long been known as climatic bubo, and its venereal origin was for many years unrecognized. Now, however, it is known to be a virus disease acquired by sexual contact and is recognized as a serious public-health problem. It demands correct diagnosis, quarantine of some sort to prevent its spread and the best treatment possible. Unfortunately, up to the present time there has been no known specific treatment, and one must do the best one can by expectant treatment. It has recently been determined that this infection, unlike most virus diseases, responds well to the sulfonamide drugs. If further experience still shows that these drugs are curative, the task of eradication will be much simpler. Here is a field in which the health authorities should undertake some serious research. Why should they wait for other organizations or universities to solve their problems for them. Research in this field seems not merely a desirable activity but actually a fundamental duty of the health authorities. No one can foretell who will finally solve the problem, but the more investigators interest themselves in this relatively new venereal disease, the sooner will the problem be solved.

Health departments in the past have made notable progress in research, as witness the studies of Chapin, of Rhode Island, on measles; of Park on diphtheria; of the United States Public Health Service on endemic typhus fever, Rocky Mountain spotted fever and the effects of fluorine in the drinking water on mottled tooth enamel; and of the United States Army on yellow fever and typhoid fever. Both the Army and Navy have conducted extensive studies on the physiology of life at the high and low atmospheric pressures occurring in submarines and in the stratosphere. These are only a few examples of research by government bodies.

Cardiovascular disease due to rheumatic fever is still an epidemiologic puzzle, although much more is known about it than was the case during the last war. Many of the studies now being made of hemolytic streptococcus diseases are showing clearly the nature and extent of the problem. Furthermore, the recent experimental use of the sulfonamide drugs in the prophylaxis of streptococcal infections is extremely promising, and it is possible that in the future rheumatic fever and other streptococcal diseases will be much more successfully controlled than in the past. Already it is known that the routine administration of small doses of one or another of these drugs to all recruits during the first weeks of their service in the armed forces cuts down the amount of hemolytic streptococcus disease. As a method of control through the use of drugs, this experiment has been highly successful, but this does not mean that the method will ultimately prove to be either the best or the simplest one. The ad-

ministration of any drug to hundreds or thousands of persons at frequent intervals over a period of weeks or months is extremely difficult and expensive, so that the search for some simpler means of control should not be relinquished. Drug control of any disease has always been expensive both in money and in personnel. If the environment can be successfully dealt with, this will be easier than dealing with the patient. For this reason, studies are being made in many places to find, if possible, some promising method of control in this puzzling problem.

Micro-organisms in the air of hospital wards and of churches, theaters and other places of public assembly can be controlled to a certain extent by the use of ultraviolet light, and also by some of the newer aerosols used as fine sprays.

Vaccination or immunization as a method of control of streptococcal infections has not as yet been successful, perhaps because a mixed group of infections is concerned rather than a single well-standardized disease. Yet one is not justified in giving up the possibility, and research will of course be continued on the subject of immunization as a method of control of the streptococcal infections.

The subject of social medicine after the war deserves consideration. The plans of the Army and Navy for the care of returned soldiers and sailors are elaborate, and since the number of persons to be taken care of is extremely large, — already almost 1,000,000 have been returned to civil life for one reason or another, — it is apparent that this example of social medicine is bound to have a considerable effect on future health policies. Just what will follow is not clear at the time, but it does not seem improbable that a greater interest in all the aspects of social medicine will be aroused. Following the last war, the government developed an extensive system of veterans' hospitals, but they have had no direct effect on the practice of medicine. On the other hand, a new and quite successful development in medical care has occurred since the last war, namely, the hospital insurance systems that have sprung up all over the country. The Blue Cross organization for hospital insurance in Massachusetts seems to have been highly successful, and the use of the system on a voluntary basis is extending. The medical profession and the public have accepted this program quite generally, and it has helped both the patients and the hospitals. The question is now whether the Blue Shield, a sickness insurance on similar lines, will be equally successful.

A good deal has been said about the introduction of exotic diseases by returning soldiers, and the principal disease referred to is malaria. It is unfortunately true that there is much endemic malaria in the several war zones. In North Africa, for example, there is widespread endemic malaria among the native populations, the malarial season is long, and transmission to the American troops is inevitable. It will be recalled that in 1880 Lavaran discovered the plasmodium of malaria while working with French troops in Algeria. Unfortunately, the disease is still extremely prevalent there, even though sixty years have passed since Lavaran made his discovery. From North Africa the troops went to Sicily, and there again were exposed to a population that has suffered from widespread endemic malaria for hundreds of years. When they crossed over the Straits of Messina to invade Calabria and southern Italy the situation was not changed, for malaria is endemic all over southern and middle Italy. It is only during the last ten years that some control has been obtained over the malaria in the Pontine Marshes and the surroundings of Rome.

The endemic malaria of the Mediterranean is not limited to Italy but is equally prevalent east of the Adriatic in Greece, Albania and southern Jugoslavia. Everyone knows of the almost epidemic prevalence of malaria in the islands of the South Seas, particularly in the Solomon Islands. The troops occupying those islands must be replaced at frequent intervals by healthy ones, and the returning troops must be put into rest areas with good hospital facilities, since almost every man in each division will need treatment and care for a time.

Malaria is not an acute disease in the ordinary sense of the word. It is really a relapsing disease that may continue to manifest itself for a year or two after the first attack. It is no longer considered necessary to discharge a man from the service because of malaria, for he can be treated and will recover from the infection just as well while in the service as at home. There are, however, many wounded men and sufferers from some chronic disease, mental or physical, who have malaria in addition to their principal disease, and these men will be sent home for proper treatment and ultimate discharge, when they will play the role of more or less chronic malarial carriers. These are bound to be a considerable element in the population of the Army hospitals at Framingham and Fort Devens. The question to be asked is, How much of a problem do they present to the public health of the adjoining communities? Undoubtedly there will be a considerable number of malaria carriers in the hospitals of this state. Since the disease is never passed along to new victims by contact, but only by the bite of *Anopheles quadrimaculatus*, the anopheline of this region, the number of secondary cases will depend directly on the number of these mosquitoes in the neighborhood of the hospitals. The Army authorities can be counted on to suppress all breeding of anophelines on the military reservations, but this will not be enough to protect the adjoining communities if they have extensive breeding areas. It is therefore obvious that these communities should make a survey of the anopheline population in their townships, so that they may make tentative plans for mosquito control later, provided that it becomes

necessary. Theoretically, it is possible to have extensive malaria in this state, but there is another side to the question. The mosquito breeding season at this latitude is short — probably less than three months each year. The number of anopheline breeding places is probably not very large anywhere in the Commonwealth. Malaria carriers have been coming here from the tropics, from our own South and from Greece and Italy over a period of many years, and the number of secondary cases of malaria that have resulted has been extremely small. There has never been falciparum or tropical malaria or quartan malaria in this region, and the only form that must be planned for is vivax or tertian malaria, which is the mildest of all the forms of the disease, with a low death rate. One must not, however, be too complaisant about the situation, since no one has any idea as to the number of carriers that will be sent here, or just how prolific the anopheline breeding will be in any particular year. All cases of malaria must be reported, and the means of anopheline control must be in readiness in the neighborhood of every Army and Navy hospital.

Some of the malarial relapses will come after the men have been discharged from the armed services and are in their homes. In this situation, the disease must be diagnosed and treated by the local practitioner. He will have the help of the state public-health laboratory and the advice of the district health office, in addition to that of the local health department. This aspect of malaria in Massachusetts should not be a serious one, since the majority of physicians and public-health officers are well trained, the means of communication are unsurpassed, and any local outbreak can be quickly controlled. Such control has not always been easy, however, and in Russia following the last war there was a terrific epidemic of malaria that extended to Archangel, above the Arctic Circle. Much the same kind of catastrophe occurred in the Balkans, and malaria was epidemic there for many years after the war. In both these regions the devastation from the war was colossal and the ways of living were primitive, and it took many years to gain the upper hand over malaria and typhus fever. Conditions in Massachusetts are so different that no such epidemic need be feared. Mosquito and fly screens are in general use, and malaria patients can and should be housed in screened buildings. Adult mosquitoes should be killed by sprays as rapidly as they are discovered. There are enough physicians to make the diagnosis and give the proper treatment, and enough health officers to identify and control the anopheline breeding in every threatened locality.

One fact worth emphasizing is that malaria has never been controlled by the administration of quinine or any other drug to its victims. It has always been necessary to control anopheline breeding to gain the upper hand of malaria transmission, and in the end this form of control is not only more satisfactory but also much cheaper than the treatment of patients.

Typhus fever is another exotic disease that may cause a great amount of difficulty in North Africa, in Italy and more especially in the Balkans, but it is a louse-borne disease and need not be feared in this state, for since the Civil War we have not been a lousy people. The disease may be introduced by returning troops or by refugees from eastern Europe, but it will not spread. Had the eastern coast of the United States been invaded by the Germans and had the cities been subjected to destruction, the usual protection against lice would have been lacking, but as things are today there is no danger of this. In the area of operations typhus fever among the troops is almost unknown, in spite of the fact that something like 75,000 cases have been reported in the North African native population. Freedom from this infectious disease is owed to two things: an efficient vaccine and a repellent powder that is dusted into the underclothes of each man and promptly kills not only the adult lice but also the nits in the seams of the clothes. The effect of one dose of the powder lasts for several days, and it is easily and inexpensively renewed.

With many prophylactic procedures, such as smallpox vaccination, it is sometimes difficult to secure the co-operation of the public, but in this anti-louse, anti-typhus fever campaign, the natives welcome the new treatment, and in some places they have made themselves more or less of a nuisance by demanding frequent and repeated delousing. One wonders whether the North African, as a result of the prophylactic methods of the health departments of the military and civil governments, may not turn out to be a much more acceptable citizen of the world than he has been in the past. Who knows how far he may advance in his civilization if once he is freed from the diseases that have for so long interfered with his cultural and economic development?

To return for a moment to the personnel of the public-health and medical services: men have been sent from civil life into the armed forces, and, in addition, a large number of recent medical-school graduates have been taken who would ordinarily have gone into practice at home. The total number of doctors involved may be estimated at 50,000. What sort of experience will this large group have in the armed services? To be sure, medicine and public health are the same in principle in peace as in war, but care of the civilian population is different from that of the soldier or sailor. For example, the medical officer does not, as a rule, deal at all with chronic disease or the problems of the aged. The Army or Navy doctor deals chiefly with acute disease, and his prime object is to take care of the lesser diseases and injuries so that his patients may return to the firing line as soon as possible. The

prevention and treatment of diseases and of injuries that frequently result in chronic disability, such as tuberculosis, are of course important but for the military man they are less important than the proper treatment of self-limited diseases and minor injuries. The physician in civil life spends much more of his time and energy in the care of chronic and more or less disabling diseases, and thus it is seen that there is a wide divergence in the point of view of the military and the civil surgeon.

Medicine in the Army, just as in civil life, includes all the specialties, and one of these specialties is preventive medicine. It is safe to say that the percentage of doctors in the armed services who act as health officers is much higher than it is in civil life. Every division and army corps and army has its own health officers and its health-department laboratory and statistical department, and in smaller commands the senior surgeon is also the health officer. When these men return home to civil life there will be a considerable number who have been active in preventive medicine and health-department activities. Some will then go into health departments, but even if they go into general practice they will understand and be sympathetic with health-department activities.

The health departments have lost many of their members to the Army and Navy, and one wonders whether either they or the public will be satisfied if the old health departments are restored to their former strength and activities. It is impossible to know, but it seems probable that there will have to be better health officials and larger health departments after the war. The medical men and the public have seen or learned of the great advances that have been made during the war in the prevention of disease. They both know that much more can be accomplished in the detection and prevention of tuberculosis, for example, than has been done in the past, and so with many other diseases, such as the venereal diseases. There is no doubt that the public will be willing to pay for the increased activities of the health departments, and in this the physicians of the country will join. Paradoxical as it may seem, it is true that a physician can make a better living in a prosperous, healthy community than he can in a population continually made poor by endemic disease, whatever its nature.

Parasitology promises to be a subject of importance in the post-war world. In this state there are not many intestinal parasites — a few round worms, seat worms and an occasional tapeworm. Returning troops, however, will bring back others. The feces should be examined for parasites, and the eosinophilia that goes with many infestations should not be overlooked. The extensive spread of parasitic disease need not be feared, since the winters are long and cold and sanitation is good. Nevertheless, the infected patient must have proper treatment.

The importance of psychiatry in post-war medicine and public health is already apparent. The morale of the returned soldier must be kept up, and he must be assisted in finding his niche in a peaceful world. What can be done to prevent the development of neuroses and psychoses is a problem worthy of further study by health departments — national, state and local.

Does the present condition of public health at home and abroad suggest any modification of our own state and local health programs? It is quite true that this state has shown good leadership in the past, and that it has, in general, good laws and flexible regulations, and it is also true that the scientific background on which public-health laws and regulations are based has been conspicuously good.

The administrative side of public health has an interesting history. As times changed and new knowledge became available, the Commonwealth has changed its form of organization, and almost every year has seen some advance in methods of bringing health to the public. Development of state and local health departments is a process that is never finished. What are the present weak points in our organization and what are the changes that should next be made? Health departments based on the small-town system of government are weak and ineffective, and they need constant help from the state health department. One cause of their difficulty is that the board of health is an executive rather than a consultative body and, as is well known, administration by a board rather than by a full-time medical officer of health is necessarily slow and cumbersome. A more modern form of organization is a full-time health officer who has an advisory council, rather than an administrative board of health. The Worcester County board has recently been reorganized on this plan, and the new body may furnish a model for future reorganizations.

Massachusetts has in the past reorganized its public-health system to meet current needs, and it will of course bring its organization into conformity with modern practice. The present is an appropriate time to make plans for the future, since health departments will be more important to the people of all states than they have been in the recent past. Massachusetts has an opportunity again to show its capacity for leadership in public health and its ability to set a model for New England.

25 Shattuck Street

ECHINOCOCCAL DISEASE

A Report of Two Cases

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ECHINOCOCCAL disease is most prevalent in the sheep-raising and cattle-raising districts of South America, Australia, South Africa, Central and Northern Europe and the Mediterranean countries of Asia and Africa. In North America 482 cases of hydatid disease in man have been reported since 1808, and of these 22 were indigenous. It is important to bear in mind that a large proportion of the immigrant population of the northern coastal states has come from countries where the disease is most frequently found. It should therefore be considered as a diagnostic possibility when atypical symptoms appear in a patient who has previously lived in one of these countries.

The disease is transmitted from sheep or cattle to dogs, which act as the intermediary host. The human infection results from contact with infected dogs. The ova may be present in the oral secretions or on the fur of the animal. The infection in man manifests itself in the form of cysts, which are either of the unilocular type or contain multiple daughter and even granddaughter cysts.

About 75 per cent of cases of echinococcal disease are found in the liver. Over three quarters of the cysts in the liver are located on the inferior surface of the right lobe so that they extend down into the abdominal cavity. The second most frequent site is the lungs.

In the clinical records of the Hartford Hospital covering a period of seventeen years, 7 cases of hydatid disease were found. Of these, 5 were echinococcal disease of the liver, 1 of the lung and 1 of the gluteal region. Four of the cases showing liver involvement had a cyst on the inferior surface of the right lobe.

This paper is primarily concerned with echinococcal disease of the liver, the symptoms of which may be simply those of a slow-growing tumor, which in time becomes palpable and causes pressure on the biliary tract and in rare cases ruptures.

Echinococcal disease of the liver may be difficult to diagnose because the symptoms may simulate involvement of the biliary tract. The following case report will serve to illustrate this diagnostic problem.

CASE 1. The patient, R. L., was a 41-year-old man who was born in Sicily, where he lived for 27 years. His trade was that of a bricklayer, but he was also employed as a policeman. In the latter capacity he was delegated to watch herds of sheep, and thus the canine contact was established. When he was 27 years old he immigrated to New York City, remaining there only 2 or 3 weeks prior to coming to Hartford, where he had lived since that time.

The patient was first seen by one of us (T. W. W.) in 1932, at which time he gave a history of having had discomfort in the right upper quadrant of the abdomen for approximately 8 years. This discomfort was in the form of typical gall-bladder attacks, pain being referred to the back, associated with vomiting and with dark-colored urine, although no jaundice was actually described by the patient. A cholecystogram taken in 1932 revealed a gall bladder with somewhat reduced function but reasonably well outlined. An operation performed purely on the basis of the clinical history revealed slight thickening of the wall of the gall bladder, but no stones. There was an enlarged node along the cystic duct. The liver was perfectly normal in appearance and there was no fibrosis along its edge. No adhesions were present. Cholecystectomy was performed, with an uneventful convalescence.

For some 2 or 3 months after the operation there was relief of the symptoms, but the episodes of distress in the right upper quadrant then began to recur. During the ensuing decade there were from two to five attacks each year.

In March, 1942, the patient was seen by one of us (J. F. J.). From the past history and symptoms a stone in the common duct was suspected, although there was no jaundice and no bile in the urine. Dietary suggestions were made, and the patient was advised to report when another episode occurred. He was not seen again until 1 year later. At that time he presented the symptoms of an acutely ill patient. The scleras showed jaundice and the urine contained bile. He stated that he had had a great deal of distress in the right upper quadrant, nausea and vomiting for several days. The stools were clay colored, and there was a positive direct van den Bergh reaction, the bilirubin level being 5.9 mg. per 100 cc. A smooth liver edge was palpable below the costal margin. It was suspected that a stone in the common duct was the basis of the trouble.

An exploratory laparotomy was advised and performed by one of us (T. W. W.). A few intra-abdominal adhesions were encountered. There was an irregular nodular mass just medial to the gall-bladder bed on the inferior surface of the right lobe of the liver. This mass extended from the superior to the inferior border of the liver, and the lower portion of it seemed to involve the hepatic ducts. Its appearance suggested a metastatic lesion, most likely secondary to a primary tumor in the biliary ducts. A biopsy was taken, and in the process a single drop of slightly cloudy fluid escaped.

The patient made an uneventful recovery, and the jaundice and biliuria cleared up within 1 week. He has returned to work and is in excellent condition, having had no attacks since the operation 8 months ago.

Pathologic examination of the biopsy specimen revealed a chronic granulomatous process with a central mass containing hooklets typical of an echinococcal infection. Subsequent to this report a blood smear was obtained that showed 8 per cent eosinophils.

It is probably true that this patient acquired his infection in Sicily some eighteen years before the diagnosis was made. It would be difficult to believe that there was no visible evidence of echinococcal infection in the liver at the first operation if the operative notes were not so complete.

The only plausible explanations seem to be either that the lesion was beneath the surface of the liver at the time of the first operation or that a small lesion was overlooked, that a very slow growth ensued and that intermittent attacks of mild cholangitis accounted for the symptoms. Finally, a severe acute cholangitis indicated further surgery. In

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retrospect the long duration of the illness was definitely against a stone in the common duct, but nevertheless this was considered the most likely diagnosis.

The complete relief of symptoms following the second operation is extremely interesting. This may have been purely a coincidence — the cholangitis would have subsided of its own accord. Certainly there was no evidence of a stone in the common duct that manipulation might have dislodged. In any case it is rather too much to expect that this patient will have no further symptoms except for the fact that the natural course of the disease in many cases seems to be a favorable one. It is well to bear this statement in mind as one considers the outcome of the second case, which presented no serious diagnostic problem.

CASE 2. M. G., a 34-year-old man born in this country, was admitted to the Hartford Hospital in February, 1935, with a mass 6 cm. in diameter in the midepigastrium that had been present for years. Radiologic investigation revealed that the mass was anterior to the stomach. The patient was jaundiced. There was an eosinophilia of 25 per cent.

At operation a cyst the size of a large grapefruit was found deeply incorporated in the liver substance. The liver itself was riddled with innumerable cysts varying in size from that of the head of a pin to that of a small marble. The contents of the large cyst was completely evacuated, a great many daughter cysts being found, and marsupialization was carried out. The immediate postoperative course was exceedingly stormy. The patient had a toxic hepatitis and was on the critical list for 8 days. He was finally discharged, however, 7 weeks after operation with a profusely draining sinus. The eosinophils had dropped to 2 per cent and have been normal ever since. He returned to work about a year later with a persistent draining sinus that necessitated daily passage of a small catheter to prevent obstruction.

This process continued for the ensuing 7½ years, during which time periodic returns to the hospital were required for the dilatation of the stricture of the sinus, which recurred in spite of the dilatation by catheter.

The sinus has now been closed for 10 months, the liver is not palpable, and the patient is apparently well.

SUMMARY AND CONCLUSIONS

Two cases of echinococcal cyst of the liver have been reported, one of long duration (eighteen years) with symptoms much akin to those of disease of the biliary tract, the diagnosis being made by biopsy at the second operation.

The second case, also of many years' duration, was diagnosed, came to operation, and was finally followed by the spontaneous closure of a sinus resulting from marsupialization. The fact that this patient was a native-born American is unusual but not unknown. It merely serves to emphasize that one cannot make a diagnosis of echinococcal disease purely on the basis of nativity.

The consciousness of the possibility of the occurrence of echinococcal disease of the liver may lead to a diagnosis of this condition in certain cases of atypical biliary-tract disease.

179 Allyn Street

MEDICAL PROGRESS

RECENT ADVANCES IN SURGERY*

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THE golden age of surgery is said to be that which followed the introduction of methods for producing surgical anesthesia and for lessening the incidence of infections. These and other discoveries widened the scope of surgery to an amazing degree. Undue haste in the performance of operations was no longer necessary. The type of alteration that occurred is illustrated by a quotation from Cushing.[1]

> The accurate and detailed methods, in the use of which Kocher and Halsted were for so long the notable examples, have spread into all clinics — at least into those clinics where you or I would wish to entrust ourselves for operation. Observers no longer expect to be thrilled in an operating room; the spectacular public performances of the past, no longer condoned, are replaced by the quiet, rather tedious procedures which few beyond the operator, his assistants and the immediate bystander can profitably see. The patient on the table, like the passenger in a car, runs greater risks if he have a loquacious driver, or one who takes close corners, exceeds the speed limit or rides to applause.

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The latter part of the last century is perhaps best known for advances in the surgery of the intestinal tract, of the breast, of hernia, of the thyroid gland and of the pelvic organs. The second and third decades of the present century are perhaps most notable for the advances in neurosurgery, whereas thoracic surgery made great strides in the fourth decade. This division is of course an artificial one, since there has been a steady progress in all phases of surgery. When considered from month to month these advances do not seem very great, but when viewed after a lapse of several years the progress is striking. Many examples could be given that would illustrate the remarkable increase in the number of fields in which surgical therapy is being employed. According to Alexander,[2] only about 300 cases of pulmonary tuberculosis were reported as having been operated on in the United States between the years 1918 and 1925. It is true that in this particular development we followed at a slow pace the lead of surgeons in other countries. Operations on the heart, the esophagus, the diaphragm,

the lungs, the spinal column, the pancreas, the blood vessels and other structures have increased greatly in number in recent years. It is of interest to consider some of the causes for this increase.

In the first place, a larger number of operations are being performed because of earlier and more accurate diagnosis. This fact is due not so much to improvements in methods of history taking and physical examination, which have advanced very little in recent years, as to advances in other diagnostic methods. Notable among these is the more frequent use of the roentgen ray, together with the employment of various contrast mediums. It would be impossible today to practice surgery effectively without the benefit of the knowledge gained from the gastrointestinal series, the barium enema, cholecystography, pyelography, ventriculography, bronchography and arteriography. What satisfaction must attend Dr. Cannon, Dr. Graham, Dr. Dandy and others who have been responsible for advances that have resulted in the earlier and the more accurate diagnosis of various diseases! A number of years ago most operations were listed as exploratory procedures. This meant that one was usually in doubt where to make the incision, was frequently unable to locate the diseased area at the time of operation if changes were minimal and usually had to cause a good deal of trauma to normal parts in order to locate the site of the disease. A striking example of the value of the roentgen ray is shown in the recognition of diaphragmatic hernias. In 1938 Harrington[3] stated that the condition was recognized at the Mayo Clinic in more than twenty-three times as many cases in the last twelve years as in the previous eighteen years.

Surgery must prove itself continually in that the benefits to be derived from an operation must outweigh the risk to life, the discomforts, the loss of time and the expense. Earlier diagnosis has been an important element in reducing the morbidity and mortality rates associated with operations. This in turn has given patients an increased confidence in what can be accomplished by surgical means, and there is less tendency on the part of the public to conceal trouble until far-advanced disease is present. The intelligent use of the roentgen ray has played a major part in this transformation. It appears to be a safe prediction that, in the future, roentgenographic studies of the chest will be made routinely on all patients. Already many asymptomatic disorders of the chest have been discovered during examination of recruits for military duty. It is just as important that the surgeon should have the advantage of the opinion of a good roentgenologist as that he should have the advice and counsel of a good internist.

Advances in the knowledge of the causes of disease also have widened the scope of surgery. Operations on the parathyroid and adrenal glands and the pancreas have ceased to be of rare occurrence. A better understanding of the functions of the sympathetic nervous system and its relation to various diseases has multiplied many times the number of operations on this system. Similar statements might be made about various other parts of the body.

Advances in the preoperative and postoperative care of patients have played a large part in the progress of surgery. Rarely today are emergency operations performed on moribund patients, since in most cases means are available for improving their condition. Hemorrhage that is uncontrollable by nonoperative means is one of the few decisive indications for immediate operation. One is seldom justified in operating before dehydration and acidosis and other such conditions have been corrected. Fortunately, the patient consults the physician earlier today than previously, and the difficult problems connected with the preparation of the patient are relatively fewer. The incidence of postoperative complications has diminished considerably, and means are available for dealing effectively with a good many of those that do occur.

Measures that are helpful in preventing pulmonary embolism deserve special emphasis. These include an appreciation of the value of frequent alteration of the position of the patient, of the use of heparin and dicumarol and of ligation of the femoral vein when indicated. Notable among the recent achievements are the various chemotherapeutic agents for preventing and combating infection and the several different methods by which intestinal distention due to a number of causes can be relieved. Great credit is due Drs. Coller and Maddock for their important studies on fluid balance in surgical patients. The problem of the feeding of patients by the intravenous route is only partly solved, but even so the results are significant and encouraging. Some of these advances will be commented on later. Lord Moynihan has said that surgery has been made safe for the patient and that we must now make the patient safe for surgery. Important strides have been made in this direction, but it is likely that the next several decades will see greater progress.

It is difficult to assess the advances in anesthesia from year to year, but the progress from decade to decade is fully evident. There are improvements in methods of administration as well as a larger number of satisfactory agents from which one may choose. There are now many anesthetists and surgeons who can choose in an intelligent manner the best anesthetic agent for the patient in question. The reduction of untoward incidents both during and following operation is due in no small measure to such advances.

There is probably no measure that has contributed more to the manner in which operative procedures of great magnitude are withstood by patients than the copious use of blood and blood

substitutes. It appears to be generally agreed that one does not wait for the appearance of fully developed shock before instituting therapy. One should prevent or treat shock according to the severity and duration of the operative procedure, the degree of blood loss and the previous condition of the patient rather than wait for an alteration in the concentration of the red corpuscles or for a severe decline in blood pressure. Traumatic shock may develop without any significant alteration in the rate of the pulse or in the concentration of red corpuscles. A decline in the arterial pressure to 90 mm. of mercury is frequently a sign of advanced rather than of early shock. At the beginning of all operative procedures of considerable magnitude a needle should be placed in an accessible vein and fluid should be administered as indicated. The quantity of blood or blood substitute required varies from patient to patient. As Dr. Harkins has said, there is no more logic in giving the same quantity of blood to every surgical patient than there would be in prescribing the same dose of insulin for every patient with diabetes. At any rate, attempts to maintain the blood volume at essentially the normal range during operative procedures have resulted in a widening of the scope of surgery, fewer deaths at the time of operation and a reduction in postoperative complications.

The importance of replacing protein that may be lost in various surgical conditions has received much attention in recent years. Protein deficiencies may be responsible, at least in part, for a number of complications, including wound disruption, abdominal distention, edema, anuria and circulatory failure. The intravenous injection of blood plasma is an efficient method for correcting acute hypoproteinemia, but it is a rather expensive and time-consuming method for giving protein nourishment. With this in mind, Elman[4] gave a high-protein diet by mouth, but since vomiting frequently rendered this method ineffective he resorted to the use of hydrolyzed protein by intravenous injection. Subsequent work has shown that the principle of introducing the building stores of protein — amino acids and peptides — is sound. This method is now used clinically rather extensively. Although some untoward reactions have been reported and although there are some contraindications to the giving of amino acids intravenously, the results are in general extremely encouraging. Protein deficiencies can be corrected and, more important, they may be prevented by the early administration of an appropriate mixture of amino acids in cases in which adequate amounts of protein cannot be taken by mouth or cannot be assimilated when so taken. This physiologic short cut in protein nutrition, with the addition of water, electrolytes, glucose and vitamins, provides an almost complete intravenous diet. The advantages of the preoperative correction and the postoperative prevention of nutritional disturbances are obvious; patients can be more adequately prepared for operation and the morbidity and mortality rates can be reduced.

Advances in chemotherapy have had a far-reaching effect on surgery. One cannot help being impressed by the radically altered outlook for patients with septicemia, meningitis, peritonitis and pneumonia that has been effected through the use of sulfonamides and, even more strikingly, that of penicillin. It is difficult in some cases to differentiate the role of chemotherapy and that of transfusions in bringing about this altered picture, because both have played their respective parts, as have better methods of maintaining balance of fluids and electrolytes and nutrition. Now that penicillin has demonstrated its ability to deal with invasive staphylococcal infections, and in view of the promise of still newer antibiotic agents in dealing with infections due to gram-negative bacilli, it seems that in a few years it will be necessary much less often to record a death as having been due to bacterial infection. Such an optimistic statement should probably be followed by an admission of our inability at present to treat effectively by chemotherapy such disorders as chronic ulcerative colitis, regional ileitis, tuberculosis, thromboangiitis obliterans and certain mixed infections of the lung and peritoneum.

Advances in chemotherapy have in no sense lessened the importance of familiarity with and careful observation of certain general practices, such as careful hemostasis and the gentle handling of tissues. It has been shown that infection will develop in wounds even in the presence of potent antibacterial drugs if there exists an unfavorable adjustment of factors concerned in repair. This observation is both an expression of the limitations of the drugs and a warning to the surgeon to observe well-established principles if he wishes to avoid infection. Tissues usually tolerate a moderate degree of contamination if the mechanisms of local resistance are not disrupted by unnecessary damage. The use of agents that suppress bacterial growth has made more evident the importance of a good surgical technic.

If one is to treat the so-called "surgical infections" intelligently, one must differentiate the systemic and local components. The local component is usually characterized at some time in its course by necrosis of tissue. Because integrity of the blood supply is essential for the systemic distribution of the drug to the site of infection, the greatest effectiveness of the agents is observed in treating the invasive types or stages of infection. Under such circumstances the necessity for treatment by operative means may be obviated, but it must be emphasized that the local accumulation of pus should be treated by open drainage. It appears that the use of chemotherapeutic agents has increased the number of cases in which local drainage

only is employed because of the striking reduction in the mortality rate associated with the systemic component of the infection. Thus far, the results that have followed the local use of the various chemotherapeutic agents in the treatment of infected wounds of soft parts and of chronically infected ulcers have not been encouraging.

The problem of operating-room infections continues to be a real one, particularly during the periods when there are many diseases of the respiratory tract. Thanks to the various chemotherapeutic agents, such infections rarely cause death, but they may cause wound disruption and other complications. The work of Hart[5] and others on the sterilization of air by bactericidal radiation has yielded encouraging results. Perhaps even more practical will be the use of glycol vapors as developed by Robertson[6] and his associates. Further progress in this important field is awaited with interest.

* * *

The next topic is a consideration of some of the advances in surgery that apply to a particular organ or structure. These will be discussed in a general way, and it is hoped that failure to refer to much important work will be pardoned.

The Esophagus

There are few parts of the body — and certainly no part of the intestinal tract — that have presented as many impediments to progress in surgery as has the esophagus. This appears to be mainly due to the fact that the blood supply of the esophagus is relatively poor, that this organ has no serosal covering and that unlike most of the intestinal tract it is a straight tube without a mesentery and without redundancy. Furthermore, it is relatively inaccessible, and the body tolerates infections of the mediastinum extremely poorly.

Carcinoma

A variety of factors in addition to those enumerated above have contributed to delay in advancement in the treatment of carcinoma of the esophagus. The onset may be insidious, and direct extension of the growth or distant metastases may be present before the symptoms cause the patient to consult a physician. The physician himself may not pay sufficient attention to complaints of slight dysphagia or moderate loss of weight. The advanced age of many of these patients has also been a handicap.

Torek[7] performed a successful resection — without anastomosis — of the midthoracic esophagus for carcinoma in 1913. The patient died of pneumonia thirteen years later. Between 1913 and 1938 a total of thirty-four successful resections of the esophagus for carcinoma were reported by eighteen authors. It is doubtful whether any of these patients lived as long as five years. The largest series of cases was reported by Ohsawa[8] in 1934. According to Adams,[9, 10] Ohsawa reported four successful resections in 12 cases of carcinoma of the thoracic esophagus, eight successful resections in 14 cases of carcinoma involving the cardia and esophagus, in which 2 to 5 cm. of the esophagus was resected, one successful resection in 5 cases in which 6 to 8 cm. was removed and two successful operations in which an esophagojejunostomy was performed.

Since 1938 much attention has been directed to the treatment of carcinoma of the esophagus, and many successful operations have been performed. Except for the problems that are common to the surgery of cancer in general, — namely, those of direct extension and metastasis, — it may be stated that surgery of the lower fourth of the esophagus and cardia has progressed[11] in a highly gratifying manner. In other words, satisfactory means are available for removing the lower part of the esophagus and cardia, for mobilizing the stomach and for making an intrathoracic anastomosis of the stomach and the esophagus. To what is this progress due? An occasional advance in surgery can be attributed to a single important discovery, but most of the advances are due to a number of more or less independent observations. Recent progress in surgery of the esophagus fits into this category. Among the many factors that have contributed have been earlier diagnosis as a result of the use of the barium meal and the esophagoscope, better preoperative and postoperative treatment, the more frequent use of transfusions and improvements in technical procedures. The latter include operative details such as the mobilization of the upper end of the stomach, the making of the new anastomosis at a point other than the previous opening and the anchoring of the stomach in the lower part of the chest in order to avoid tension on the suture line of the anastomosis. The experimental observations of Adams and Phemister[10] and of Carter[12] have been particularly helpful in clarifying these points.

Operations on the upper three fourths of the esophagus have been less satisfactory, mainly because of the difficulty in re-establishing the continuity of the alimentary tract. The upper fourth, that part between the base of the neck and the superior surface of the aortic arch, presents an added difficulty in that the proximal esophageal end is so short that the establishment of an external fistula may not be possible. Garlock[13] has recently reported the result in a patient with carcinoma of the midportion of the esophagus in whom he was able to mobilize the stomach sufficiently to make the anastomosis at a level just below the aortic arch. If one is able to remove the growth and to bring out the upper end of the esophagus, the possibility of connecting this to the stomach by a tube of skin or of rubber always remains, but it is not a desirable type of anastomosis.

During the last two years Rienhoff[14] has used a modification of the method of Roux[15] in the treatment of carcinoma of the esophagus. The large vessels leading to a segment of jejunum are divided near the superior mesenteric artery, the jejunum is cut across at one point, and the mobilized end is brought through the diaphragm and the chest rather than through a tunnel beneath the skin of the chest wall. In this manner it is possible to obtain enough viable jejunum for replacement of the entire esophagus. Sweet[16] has recently described a modification of the Roux procedure that aids in the mobilization of an undivided segment of the jejunum. This method can be used when the defect that is to be bridged is not so great as that mentioned above.

Benign Strictures

Most patients in whom strictures of the esophagus develop as a result of the swallowing of chemicals can be carried along fairly satisfactorily by repeated dilatations. There are some, however, in whom the obstruction becomes complete. One of the main difficulties in esophageal reconstruction from whole skin is the appearance of fistulas at the point of union of the skin with the esophagus or the stomach, particularly the latter. Additional disadvantages are the multiple operative procedures that are necessary in order to complete the tube of skin and the absence of peristalsis. Other measures that have been used in the making of an artificial esophagus include the placing beneath the skin of the anterior chest wall of a mobilized loop of the colon, the greater part of the mobilized stomach or a gastric tube that is constructed from the greater curvature of the stomach. The various methods are reviewed in an excellent article by Ochsner and Owens.[17] Yurasov[18] stated recently:

> The brilliant idea formulated by Roux and Gerzen of substituting a mobilized segment of the jejunum for the original, useless esophagus was first put into practice by Gerzen in 1908, but found few adherents because of the high incidence of necrosis in the mobilized jejunal loop. Slight changes in this technique introduced by Lexer in 1911 to a very large degree obviated this danger.

Lexer[19] brought the jejunal loop up to the midportion of the anterior wall of the chest and employed a short tube of skin leading to the cervical esophagus. This technic has been until recently the procedure of choice in the creation of any artificial esophagus. Because of the multiple stages necessary, because of ulcers at the junction of skin and mucous membrane and because of the absence of peristaltic movement in the skin tube, Yudin has abandoned the Lexer technic and has modified slightly the original Roux procedure.

The technic of Yudin[20] has not been described in detail; but it is essentially the Roux procedure. A section of jejunum 30 to 40 cm. in length is mobilized by dividing the vascular pedicle near the root of the mesentery. At a second stage the jejunum is divided proximally and the end of the mobilized section is placed in a tunnel beneath the skin of the anterior chest wall that extends to the mandible. At this or a subsequent operation the jejunum is anastomosed to the side of the esophagus at a level just above the clavicle. Regarding the results Yurasov,[18] Yudin's associate, stated: "We have performed thirty-eight esophagoplasties by bringing the jejunum up to the clavicle. In 14 of these cases the cervical segment of the esophagus was anastomosed with the jejunum. . . .We lost only 4 of our 38 patients."

Yudin's success may be explained in part by the fact that he was dealing with a benign lesion and that it was not necessary to divide the esophagus. As stated previously, the jejunum is anastomosed to the side of the undivided esophagus. It has been found by a number of observers that complete obstruction of the esophagus of dogs produces death in from one to three days. An entirely adequate explanation for this has never been advanced, but it is certain that both man and dog tolerate poorly division of the upper part of the esophagus.

Atresia

Congenital atresia of the esophagus with tracheoesophageal fistula has presented one of the most difficult problems in surgery. An illustration of this is presented in the report of Lanman [21] of 32 patients with congenital atresia of the esophagus who were treated in the Children's Hospital in Boston. He stated: "In spite of the fatal outcome in all the 30 operative cases, it is felt that considerable progress along rational lines is being made. The successful operative treatment of a patient with this anomaly is only a question of time." It is only recently that the results have become encouraging. It has been almost five years since Leven performed the first of a number of operations on an infant with atresia who is now alive and well. Ladd[22] has a total of 13 infants with congenital atresia of the esophagus who are alive, the oldest of these being four and a half years of age. Haight[22] has had remarkable success with the use of the ideal plan of extrapleural ligation of the fistula and primary anastomosis of the esophageal segments. This procedure was feasible in 17 of 24 infants in whom an exploration of the anomaly was performed. Six of the 16 patients in whom a primary anastomosis was performed are living from four and a half months to three years after operation, and all feedings are swallowed through the reconstructed esophagus. Several other surgeons, including Daniel,[23] have had success in a smaller number of patients.

It is likely that time and additional experience will show that primary anastomosis as used by Haight is the procedure of choice in those patients in whom the two ends of the esophagus can be brought together. On the other hand, improvements in methods for creating an artificial esophagus may point to the simpler procedure of bringing out

the upper and lower segments at the first operation under local anesthesia and subsequently performing a plastic procedure. The problem will probably be one of evaluating a higher earlier mortality rate associated with primary anastomosis as compared with a poorer functional result accompanying a delayed plastic procedure.

Surgery of the Lungs

Advances in surgery of the lungs have proceeded at a rapid pace, and no attempt will be made to consider them in detail. The increased use of the roentgen rays, lipiodol injection and the bronchoscope has resulted in earlier and more accurate diagnosis. Included among the functional tests that have been brought to a greater degree of perfection is bronchospirometry, by which the respiration of each lung can be measured.

Bronchiogenic carcinoma constitutes approximately 8 per cent of all carcinomas. It is only eleven years since the first one-stage removal of an entire lung was performed by Graham.[24] Shortly after this pneumonectomy for carcinoma, Rienhoff[25] removed an entire lung in a child. Graham[26] stated recently:

> Rienhoff early demonstrated by his first case, in which the operation was carried out at almost the same time as my first case, that it is not necessary to perform a thoracoplasty in order to obliterate the pleural space and that individual ligation of hilar structures with a careful suturing of the bronchus has many advantages over the mass ligation of the hilar pedicle. These principles have now been generally accepted as procedures of choice. Total pneumonectomy, therefore, today usually means an operation for the complete removal of a lung, performed in one stage and with individual ligation of hilar vessels and suturing of the bronchus.

As is true in most well-conceived operative procedures, there has been a steady decline in the mortality rate associated with total pneumonectomy. At least part of this reduction is due to a realization of the futility of such an extensive procedure if there is much involvement of the mediastinal nodes, if there is bloody pleural fluid or if the phrenic or recurrent laryngeal nerve is paralyzed. Graham[26] has had a series of 104 patients in whom total pneumonectomy was performed, eighty-one of the operations being for neoplasms. The mortality rate in his last seventy cases for malignant neoplasms has been 30 per cent and that in the last 25 cases 12 per cent. Rienhoff[27] has performed eighty-six total pneumonectomies, sixty-four of which were for bronchiogenic carcinoma. His mortality rate during the last several years has been 12 per cent.

Total pneumonectomy has now been performed many times by many surgeons. Of greater importance than the steady reduction in the operative mortality rate is the fact that a number of the patients have shown no evidence of extension or metastasis. Furthermore, ordinary activities are very little restricted.

In a recent impressive personal experience, a right total pneumonectomy was performed for a large pulmonary metastasis that was detected more than four years after resection of the large bowel for carcinoma. The convalescence was uneventful and the patient left the hospital two weeks after the operation. He returned to work, but pneumonia developed in the remaining left lung four months after operation. This responded rapidly to sulfonamide therapy, and the patient left the hospital after a stay of one week. He returned to work one week later and has done well during the last three months. There has been a gain in weight of 11 pounds since the operation. When one recalls that it was twenty-five years after Billroth performed the first partial gastrectomy for cancer of the stomach before the procedure received any great attention, it is remarkable how rapidly and how widely total pneumonectomy has been accepted.

Suppurative disease of the lung and bronchiectasis in particular have constituted the most frequent single indication for lobectomy. The reduction in the mortality rate in recent years has been highly gratifying. Probably the chief factor in this reduction has been replacement of the massive hilar ligature by individual ligation of the vessels and a careful closure of the bronchus. A forward step was taken by Nelson,[28] by Churchill and Belsey[29] and by others when it was suggested that the bronchopulmonary segment should replace the lobe as the surgical unit of the lung. Probably everyone will agree that the removal of the diseased part should be accompanied by the conservation of as much normal pulmonary tissue as possible. Progress has also been made in the surgical treatment of other types of suppurative disease. An increasing number of chronic lung abscesses are being treated by lobectomy or pneumonectomy. Some cases of recurring unilateral pneumonitis and of lipoid pneumonia may be relieved by the same means. If congenital cystic disease is localized, the treatment consists of resection, preferably before infection has occurred. More than a year ago I performed a two-lobe lobectomy on the right side for congenital disease in an infant two months of age, and the result has been highly gratifying. It is the opinion of Gross[30] and of others that young children tolerate pulmonary resection satisfactorily.

One of the most important advances in the treatment of tuberculosis has resulted from an appreciation of the frequency of tracheobronchial infection and from the realization that this should be treated before collapse measures are employed. The indications for collapse therapy have been gradually extended and any patients who would previously have been treated by pneumothorax therapy are now being treated by thoracoplasty. The most significant recent change, however, has been in the increase in popularity of lobectomy and pneumonectomy in the treatment of pulmonary tuber-

culosis. Most of the early operations of this type were performed because of a mistake in diagnosis. When it was observed that many of the patients recovered, surgeons were encouraged to use this method of therapy in treating certain patients with tuberculosis. Dolley and Jones [31] stated in 1940 that there is a definite place for lobectomy in certain cases and probably a place for pneumonectomy in a small group of cases. The main indications for these procedures have been considered to be the presence of strictures of bronchi that prevent adequate aeration and drainage, thick-walled uncollapsible cavities and tuberculous bronchiectasis. Churchill and Klopstock[32] have recently reported 6 cases in which patients with tuberculosis were treated by lobectomy. In 3 of these the orthodox indications for resection were present, whereas in the remaining 3 the usual indications for thoracoplasty existed but lobectomy was performed by election. Healing per primam occurred in all cases.

Churchill and Klopstock[32] stated:

> Lobectomy provides a more selective and immediate method of eradicating certain lesions of tuberculosis than does collapse therapy. It may be used subsequent to artificial pneumothorax, thereby restoring to that procedure the reputation of finesse that it should enjoy. A method of treatment that combines conservation of lung function, with immediate conversion of the sputum, and a shortening of the span of treatment cannot be dismissed until its scope has been more fully explored.

These authors,[32] who make a sharp distinction in the indications for lobectomy and for pneumonectomy in the treatment of tuberculosis, write:

> At the present time, total pneumonectomy cannot be considered an alternative to collapse therapy *provided that collapse therapy is applicable to the case under consideration. It is both irreversible and nonselective.* It irrevocably and seriously limits any therapeutic procedure that may be needed for the lung of the contralateral side. Circumscribed by strict indications, total pneumonectomy in tuberculosis may be a lifesaving operation when no other procedure is feasible. Lobectomy, on the other hand, is proposed as a *highly selective measure* for dealing with certain unilobar lesions. It is, indeed, far more conservative of pulmonary functions than even a seven-rib thoracoplasty.

During the last two years Overholt[33] in a few cases has deliberately elected pulmonary resection in preference to thoracoplasty. He has this to say regarding the use of lobectomy and pneumonectomy in the treatment of tuberculosis:

> It can be definitely stated that the tuberculous subject and a patient with a positive sputum does not introduce any particular or unique hazards in regard to tissue healing. We can also state with certainty that the matter of resecting a tuberculous lung presents no unusual technical problem if the procedure is carried out as a primary form of treatment. The dissection of the hilum is carried out with probably greater ease than the dissection of the hilum in patients with suppurative disease or tumor. The problem of preventing contralateral spread still bothers us.

Overholt is of the opinion that pulmonary resection will not come to occupy so prominent a place in the treatment of tuberculosis as does pneumothorax therapy or thoracoplasty. During a ten-year period he[33] and his associates have selected 94 patients in whom pulmonary resection was carried out, whereas well over 2000 patients have been treated by thoracoplasty during the same period. In 1942 and 1943 Overholt performed pulmonary resections on 59 patients with tuberculosis, with a mortality rate of 13 per cent. Pneumonectomy was performed in the majority of the cases. Since poor-risk patients were included, this accomplishment is an enviable one.

It is unnecessary to point out that the use of pulmonary resection in the treatment of pulmonary tuberculosis is in a formative stage. It is my opinion that the indications for resection are being extended too rapidly.

(To be concluded)

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CASE 30331

PRESENTATION OF CASE

A twenty-four-year-old man entered the hospital because of shortness of breath, chest pain and inability to swallow.

The patient satisfactorily passed the Army induction examination twenty months before entry, but was discharged five months later. Eight months prior to admission, on examination for re-entrance into the Army, he was told that the x-ray films showed a tumor in the mediastinum. At that time he was asymptomatic, but within the next two months he noted a dull substernal pain on turning his head to one side and easy fatigability. He had considerable trouble swallowing solids, and moderate trouble with liquids. He developed a sensation of fullness in the throat and shortness of breath on exertion. One month before entry the substernal pain increased in frequency and severity, but still did not bother him especially. He had lost 20 pounds in eight months.

For eight years he had had a persistent hoarse voice, which he first noted following a sore throat. He had had occasional head colds and cough productive of whitish phlegm for several years.

Physical examination showed a well-developed, well-nourished man in no distress. The voice was hoarse, and there was an occasional cough. The heart and lungs were normal. There was no tracheal tug or increase in the mediastinal dullness. Moderate costovertebral-angle tenderness was present, but the abdomen was otherwise negative.

Laryngeal examination showed normal movement of the arytenoids and of the vocal cords. The cords did not completely occlude on adduction. There was slight thickening of the upper surface of the left cord, which prevented the cords from coming together. No evidence of active paralysis, any growth or tuberculosis was seen.

The blood pressure was 104 systolic, 46 diastolic, on the right, and 124 systolic, 60 diastolic, on the left. The temperature, pulse and respirations were normal.

Examination of the blood showed a white-cell count of 5800, with 70 per cent neutrophils. The hemoglobin was 14.5 gm. per 100 cc. The urine was normal. A blood Hinton test was negative.

X-ray examination of the chest showed the lung fields to be clear throughout. The heart was vertical in position, and the aortic knob was not visible in the posteroanterior projection. On the left side the hilar shadow was prominent, owing to an ill-defined, round, soft-tissue mass measuring 3 cm. in diameter (Fig. 1). In the lateral and oblique views it appeared to be close to the aortic arch. Fluoroscopically it did not seem to pulsate. No displacement of the esophagus was seen. A barium swallow showed no delay in passage, and the outline of the esophagus was normal. Lateral films of the chest revealed the mass to lie just to the left and slightly anterior to the spine in relation to the descending aorta.

On the sixth hospital day an operation was performed.

DIFFERENTIAL DIAGNOSIS

DR. MERRILL C. SOSMAN†: The history makes one think immediately of mediastinal tumor, particularly with the report from the Army induction center that the x-ray films showed a tumor in the mediastinum. From what we see in the x-ray films the findings are out of proportion to the symptoms that this man presented. It is perfectly possible that a large part of these symptoms recorded were due to the fact that he was told at the induction center that the x-ray showed a tumor of the mediastinum. In other words, the dull substernal pain, the easy fatigability and the trouble with swallowing could all have been caused by pure nervousness, a psychologic upset because someone had told him that he had a tumor in the mediastinum. Aside from that I do not believe the history gives much of a lead. Occasionally, of course, a history alone makes the diagnosis. A classic example of that is angina pectoris. In fact, that is the only way one can make the diagnosis of angina pectoris in the majority of cases.

The physical examination is of no help. It was entirely negative except for the blood pressure, which was definitely lower on the right than on the left. I should like to know whether that was repeated and confirmed or whether it was a single observation.

DR. BENJAMIN CASTLEMAN: It is the only one recorded.

DR. SOSMAN: It is perfectly possible on a single examination to get a lower pressure on one side than on the other, again owing to psychic stimulus. The pain of pressure on one arm could excite the patient and give a higher reading in the second arm. A discrepancy of this sort should be checked and verified two or three times or on successive dates. This was only a single observation so far

*On leave of absence.

†Roentgenologist, Peter Bent Brigham Hospital; clinical professor of roentgenology, Harvard Medical School.

as we can tell, and it was the only positive physical finding in the entire examination. I doubt if the slight thickening of the upper surface of the left vocal cord had any relation to the disease in this man's chest and I also doubt if the little lesion that was seen in the x-ray examination was the cause of all the symptoms that are described. I should, rather attribute these symptoms to nervousness and worry in a man who had been told that he had a mediastinal tumor.

So far as these x-ray films are concerned, I must frankly admit that I had great difficulty in locating the small mass described in the lateral and oblique views. The anteroposterior view on fairly close scrutiny shows a normal chest, a small heart and a prominent pulmonary artery, which is seen in a great many individuals with ptotic hearts. There is a little extra added here in the way of a double curve just below the pulmonary artery on the left border, projecting out in the region of the root of the left lung — a shadow that is about 2 cm. in width and 4 to 5 cm. in length. I stopped in the X-ray Department on my way over to see if Dr. Robbins could show the mass to me and he admitted that he could not see it. I frankly admit that I cannot be sure of the tumor shadow in the lateral and oblique views. It was probably observed and located fluoroscopically; by rotating the patient one can tell by the angle of disappearance how far forward or posteriorly the shadow is.

Can you see it any better than I can, Dr. Robbins?

DR. LAURENCE L. ROBBINS: I cannot see it anywhere except in the anteroposterior film. I think that the statement must have been based on a fluoroscopic observation.

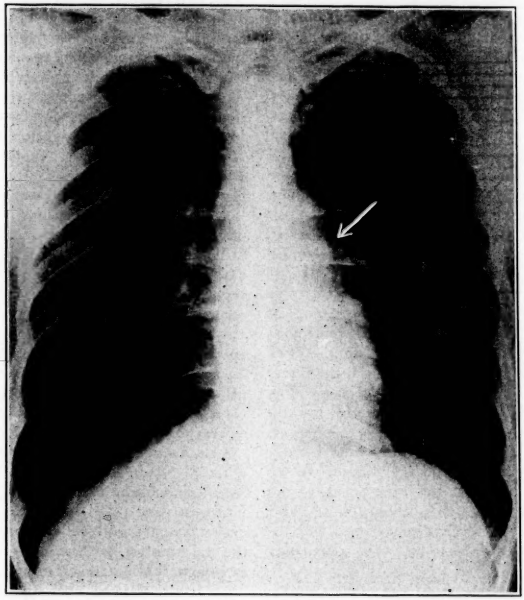

FIGURE 1.

DR. SOSMAN: It is stated: "On the left side the hilar shadow was prominent, owing to an ill-defined, round, soft-tissue mass measuring 3 cm. in diameter. In the lateral and oblique views it appeared to be close to the aortic arch. Fluoroscopically it did not seem to pulsate. No displacement of the esophagus was seen. A barium swallow showed no delay in passage, and the outline of the esophagus was normal." The last statement indicates a rather striking discrepancy from the recorded symptoms of difficulty in swallowing, particularly the swallowing of solids.

The history certainly suggests a mediastinal tumor. The x-ray examination shows a very small, rather indeterminate shadow in the region of the

root of the left lung. It is hard to conceive how a shadow of that size and in that location could have given these symptoms. It is almost impossible to attribute the difference in blood pressure in the two arms to a small tumor in that location. If that discrepancy was real and not a faulty observation, one has to assume that it was caused by something else, perhaps a congenital anomaly of the blood vessels.

The possibilities in the way of diagnosis are legion. I do not know of any group of diseases that is more complex or variable than that of mediastinal tumors. These are divided into seven groups.

The first group comprises lymph nodes, the two main divisions being the inflammatory group and the neoplastic group, the latter primary and metastatic. The primary lesions, of course, are the malignant lymphomas. I do not believe that we can call these lymph nodes, either by their location or by their distribution. The patient had no evidence of infection to go with such a thing as tuberculosis or fungus infection or the nonspecific infections of lymph nodes. So I think we can rule out the lymph nodes, which are the commonest group of mediastinal tumors.

The second group consists of primary tumors of the mediastinum. The dermoids and the teratomas are nearly always in the anterior mediastinum. They are smooth, round, quite distinct in outline and quite unlike the appearance in this case. The ganglioneuromas and neurofibromas are usually posterior and arise from the intercostal nerves. Again, they are in a different location and have a different x-ray appearance from the shadow we see here. Occasionally we find the rare types, — the lipomas, the fibromas, the chondromas and even the cystic tumors (hygromas or lymphoangiomas), — none of which fit this particular picture.

The third group, infections in the mediastinum, I believe is ruled out. There is no evidence in the history or in the x-ray examination of an inflammatory process.

The thyroid tumors and thymomas come together in a single group. They are nearly always in the anterior and upper portions of the mediastinum, although they are occasionally found in the middle third, even as far down as the diaphragm, and are rarely found as an aberrant thyroid gland anywhere in the mediastinum.

Tumors of the esophagus, either the mucosal tumors or the extramucosal tumors of the esophageal wall, must be considered, although the fluoroscopist said that the esophagus was not displaced and there was no delay in the swallowing of barium. They most frequently occur in the middle third of the posterior mediastinum and sometimes have a slight attachment to the esophageal wall, and that slight attachment may be capable of causing symptoms without showing anything in the x-ray examination in the way of a filling defect or obstruction.

The tumors of the heart and aorta are next. We can rule out aneurysms and various tumors of the pericardium itself.

That leaves the bronchi as the only remaining source of origin for this tumor. We can rule out primary tumors of the bronchi. They are usually intrabronchial, and cough is the chief symptom. The patient's age is against it. He had no atelectasis, and no history of the raising of bloody sputum. In other words, all the symptomatology of carcinoma of the bronchus is missing, which does not rule it out to be sure, but is strongly against it. There are also the tumors that Dr. Robbins[1] has described, bronchiogenic cysts, apparently embryonic tumors that develop cysts. These nearly always have smooth, round, distinct outlines, whereas this tumor, as I see it, has a serrated lobular outline. Then there is what has been called a "hamartoma," a fascinating tumor that I spring on every possible occasion to show my erudition. It is a congenital rest or bud, and in this particular case, a lung bud, presumably an aberrant lobe, with undeveloped, collapsed lung containing recognizable lung tissue; it may become cystic, the cavity being lined with pulmonary or bronchial epithelium. Hamartomas and bronchial cysts overlap: some pathologists call them one thing and still others call them another, although "hamartoma" may be considered the basic classification for the entire group.

I shall summarize by saying that this patient had a small indefinite mediastinal mass. Since I have ruled out most of the possibilities that I had listed, I suggest that it was either one of the bronchiogenic cysts (hamartoma) or one of the duplications of the gastrointestinal tract, a cyst attached to the esophagus. I rather favor the former because fluoroscopy showed nothing in the esophagus. I should be interested to know what the x-ray interpretation was.

DR. CASTLEMAN: Dr. Davis's interpretation on fluoroscopy was that it had the appearance of an enlarged lymph node, fitting in with the first of your seven groups.

CLINICAL DIAGNOSIS

Neurofibroma of posterior mediastinum.

DR. SOSMAN'S DIAGNOSIS

Hamartoma of left lung (undeveloped lung bud).

ANATOMICAL DIAGNOSIS

Sarcoid of mediastinal lymph nodes.

PATHOLOGICAL DISCUSSION

DR. CASTLEMAN: I am sorry that Dr. Sweet is not here to describe the operative findings. His

note reads: "One large, irregular, dark gray mass of tissue was removed from under the arch of the aorta and another, measuring 2 by 3 cm., from the midline above the arch of the aorta. Two other small 'nodes' were left behind." Apparently the first mass that Dr. Sweet refers to is that represented by the shadow with the serrated border indicated by the arrow in the roentgenogram of the chest (Fig. 1).

Microscopic examination showed that these masses were lymph nodes almost completely replaced by sarcoid.

I suppose that it is quite possible that the films taken by the Army showed a larger mass and that at the time of operation the sarcoid was in the process of regression. We know that in most cases of sarcoid the mediastinal nodes regress after a period of time; there is another group, however, that progress to involve the lung parenchyma itself. The general belief is that the mediastinal nodes become involved first and that involvement of the lung parenchyma is secondary. One ordinarily thinks of enlarged lymph nodes as being secondary to a neighboring lesion but a great many cases have been reported, especially from Sweden,[2] and we have had several here, that showed primary enlargement of hilar nodes followed by parenchymal disease. Has that been your experience, Dr. Sosman?

DR. SOSMAN: Yes; first the hilar nodes, and then retrograde lymphatic spread into the lungs.

DR. CASTLEMAN: The same principle of retrograde lymphatic spread probably occurs in metastatic carcinoma to the mediastinal nodes from cancer of the stomach or other extrapulmonary carcinomas. In other words so-called "lymphatic spread" of pulmonary metastases may begin in the lymph nodes and extend into the lung parenchyma rather than drain from the lung into the lymph nodes.

Dr. Ronald C. Sniffen has recently reviewed our cases of metastatic pulmonary carcinoma with Dr. H. P. Mueller of the X-ray Department.[3] They believe that the lymphatic spread of carcinoma has a characteristic x-ray pattern and that in many cases it develops by retrograde extension from the hilar lymph nodes.

DR. SOSMAN: We have seen it occasionally, but it is rare.

Do you believe that this small group of lymph nodes involved with sarcoid could have accounted for all this patient's symptoms.

DR. CASTLEMAN: No, unless they were larger at one time. It would be interesting to find out whether the blood-pressure readings were repeated and found to be different on the two sides. I do not believe that pressure on the vessels by these nodes would have caused a difference in the blood pressure in the two arms.

DR. SOSMAN: The most striking thing about sarcoid, in my experience, and a valuable point in making the diagnosis, is the marked discrepancy between the extensive pulmonary involvement, including the hilar and mediastinal nodes, that is usually present and the paucity of symptoms. Patients do not have symptoms with sarcoid. Here there was slight involvement and marked symptoms. The symptoms suggest that he was worried about his condition.

DR. JOSEPH C. AUB: Was the plasma protein ever determined?

DR. SOSMAN: And the globulin?

DR. CASTLEMAN: No. It would also be interesting to know the results of a tuberculin test.

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CASE 30332

PRESENTATION OF CASE

A seventy-seven-year-old retired domestic entered the hospital because of hemoptysis and sudden chest pain.

The history was quite inadequate. The patient had apparently been in good health until two or three months prior to entry, at which time she complained of dull pain in the lower right chest. She was apparently able to carry on until two days before entry, when she experienced a sudden "crack" in the region of the lower right costal margin. This was followed by pain that persisted, according to the record, "as a severe episodic form of pain exaggerated by respirations." She developed a cough productive of blood-streaked or rusty sputum. The abdomen became distended, and swelling of the ankles developed. She was unable to sleep or eat. She had no true chills but several "sieges of trembling."

The past history was essentially negative. She had slept on two pillows all her life.

Physical examination showed an emaciated, cyanotic, dehydrated woman. The skin was warm and dry. The lips and tongue were dry. Chest expansion was poor on the right with dullness and decreased breath sounds, voice sounds and tactile fremitus over the lower half. Coarse moist rales were heard over the upper half of both lungs. The heart was of normal size. The sounds were of fair quality, and there were occasional extrasystoles. The abdomen was distended and taut. Slight pitting edema of the ankles was noted.

The blood pressure was 120 systolic, 60 diastolic. The temperature was 104°F., the pulse 130, and the respirations 30.

Examination of the blood showed a red-cell count of 4,050,000, with 13.9 gm. of hemoglobin. The white-cell count was 21,800, with 88 per cent neutrophils, of which 80 per cent were band forms and 8 per cent myelocytes. There was marked

toxic granulation of the polymorphonuclears, and the platelets were decreased in number. The urine gave a specific gravity of 1.018 and a + + + test for albumin; the pH was 5. The stools were dark brown and guaiac positive. The nonprotein nitrogen was 80 mg. per 100 cc. and the protein 4.9 gm.; the chloride was 81.4 milliequiv. per liter. The sputum was rusty and thick; a smear showed many gram-positive lancet-shaped diplococci with large capsules, which did not look like typical pneumococci.

X-ray examination of the chest showed a homogeneous area of increased density arising in the right chest to the level of the third rib anteriorly. The lung could be seen in front and behind this area (Fig. 1).

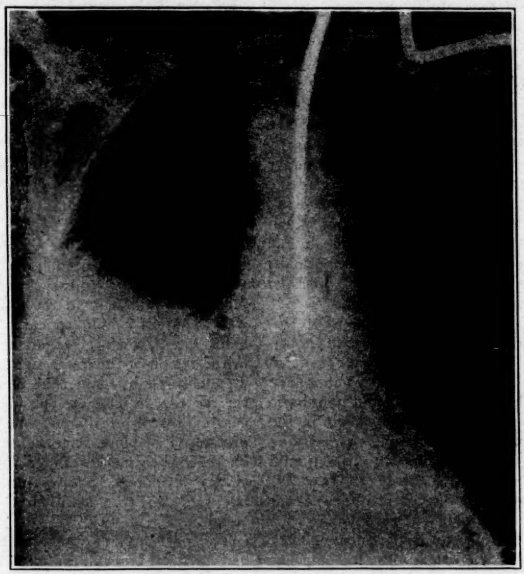

FIGURE 1. *Roentgenogram of Chest.*

The patient was placed in an oxygen tent and given 1500 cc. of 5 per cent dextrose in water to which had been added 2 ampoules of sodium lactate, 5 gm. of sulfadiazine and 4 cc. of Cedilanid. She was then placed on 1 gm. of sulfadiazine every six hours and 0.1 gm. of digitalis daily.

She declined steadily and died twenty-two hours after admission.

DIFFERENTIAL DIAGNOSIS

DR. REED HARWOOD: Most of us seeing this patient in the Emergency Ward or in the home for the first time would, I think, make a diagnosis of lobar pneumonia. Both the history and the physical findings are consistent with that diagnosis. She had pleural pain, fever, rusty sputum containing many organisms that were possibly pneumococci, cyanosis and abdominal distention. After receiving the reports of the blood chemical findings we might add to this diagnosis that she had severe kidney disease, probably of the chronic arteriosclerotic type.

In an exercise of this sort we have to examine the facts a little more carefully and go back over the record to see if we cannot find some flaws in the apparent diagnosis. She had had pain in the right lower chest for two or three months before admission, which makes one wonder if the symptoms and signs in the right lower part of the lung were not due to some previous lesion in the lung. I thought immediately of the possibility of tumor in the right lower lobe or possibly tuberculosis. I imagine that the "crack" that occurred with the onset of pain, simply represented the sudden onset of pleurisy. We learn later that she had swelling of the ankles. Two thoughts occurred to me in connection with this: she might have had a thrombophlebitis followed by pulmonary infarction or she might have developed congestive failure. The patient was an old woman, and an acute infection of this sort

might well put such a strain on the heart that congestive failure resulted.

Regarding the signs in the lungs, we know that she did not have bronchial breathing in the right lower lobe, nor were rales described in that region. Occasionally a patient with lobar pneumonia with a plug in the bronchus will show diminished breath sounds rather than the typical increased breath sounds with bronchial breathing. Also, patients who have an accumulation of fluid overlying a consolidated lung may show diminished breath sounds. I should say that, regardless of the lesion, there was some disturbance of transmission of sounds from the bronchus to the chest wall, probably due to a plug in the bronchus, either a tumor or an accumulation of exudate.

The urine had a specific gravity of 1.018, which is rather good for a patient who has severe damage to the kidney.

Then we come to the rather striking finding that she had occult blood in the stools. I am not going to allow myself to be led astray by that finding. It is perfectly possible that she had an independent lesion in the bowel, such as a carcinoma, but there is no other evidence in the record. She might have had small ulcers in the large bowel as the result of uremia. Even more likely than either of these possibilities is that she had swallowed some of the bloody sputum.

The statement is made that the diplococci did not look like pneumococci. I do not know of any other gram-positive, lancet-shaped diplococcus, and I am going to assume that these were pneumococci even though they did not appear typical.

We finally come to the examination of the chest and the statement that the lung could be seen in front and behind the area of increased density which suggests that she did not have consolidation of the entire lower lobe but rather a circumscribed lesion with more or less normal lung in front and behind.

Dr. Laurence L. Robbins: This is the shadow of density that was described. It lies laterally and posteriorly in the lower portion of the right chest. We do not know exactly the level of the right half of the diaphragm, but we can assume that it is approximately normal because there is air extending down to a shadow that has the appearance of the anterior portion of the diaphragm. In the lateral view, the mass is bounded anteriorly by a straight line and posteriorly some air extends behind it for a distance. The films are not all that could be desired. The patient was not in sufficiently good condition to be fluoroscoped, so that we were not able to go any farther in localizing the lesion.

Dr. Harwood: Is not the outline of the edge of the lesion remarkably smooth?

Dr. Robbins: Yes.

Dr. Harwood: Does that convey anything to the radiologist that the internist would not appreciate?

Dr. Robbins: I saw these films when they were wet and interpreted the shadow as either a tumor or an encapsulated empyema.

Dr. Harwood: The evidence seems to be against the initial impression that the patient had a lobar pneumonia, unless we can say that she had had it at an earlier date and had had an encapsulated empyema later. I do not know whether I can make a diagnosis, but I am going to say that she had a pneumococcal infection in the right lower lobe and that the infection was secondary to some other process going on in the chest. It seems to me that there are two possibilities — pulmonary infarction at the time of the chest pain two or three months before entry or a tumor that had partially occluded a bronchus, with infection behind it and with a communication between the tumor and the lower bronchus, from which infected material was being coughed up. If I must make a choice, I shall say a carcinoma of the bronchus.

Dr. Benjamin Castleman: Would you like to voice an opinion, Dr. Sosman?

Dr. Merrill Sosman: Sitting back here it looks as if there was marked elevation of the right diaphragm, with a distinct, smooth outline, and a round dome, although Dr. Robbins pointed out a small shadow in the lateral view, which probably represents the right half of the diaphragm. I believe that I have seen this series of events following rupture of a subphrenic abscess into the pleural cavity, with the production of an empyema. The sudden onset of pain may have occurred at the time of rupture. Of course, the fever and leukocytosis go with infection.

Dr. Harwood: I thought of that as a possibility but decided that the patient would have to have been much sicker during the two-month period.

Dr. Jacob Lerman: This patient was sent into the hospital with a diagnosis of tumor of the lung, probably on the basis of what occurred three months before entry. The physical examination was characteristic of lobar pneumonia, although there were a few atypical findings — her appearance and some of the physical signs. The sputum impressed me as being unusual, not the typical rusty sputum that one sees with lobar pneumonia. When examined here, it was dark brown, thick and tenacious, rather different from the ordinary rusty sputum of lobar pneumonia. Also, the signs in the lung were not characteristic of lobar pneumonia. The X-ray Department suggested empyema. We went over the films carefully and were against that diagnosis because there was no displacement of the mediastinal contents. Yet the signs were those that one sees with a plugged bronchus without displacement.

Clinical Diagnosis

Lobar pneumonia.

Dr. Harwood's Diagnosis

Carcinoma of bronchus, with secondary pneumococcal infection.

Anatomical Diagnoses

Lobar pneumonia (Friedländer's bacillus).
Bacteremia (Friedländer's bacillus).
Duodenal ulcer, acute.

Pathological Discussion

Dr. Castleman: At autopsy we found about 100 cc. of turbid fluid in the right pleural cavity and a similar amount on the left side. The mass seen by x-ray proved to be a consolidated right lower lobe which on section was soft and brownish gray and on scraping the surface a large amount of mucoid material was obtained. Cultures from the lung and heart's blood showed the typical mucoid Friedländer's bacillus. The fact that the patient died twenty-four hours after admission, two days after the onset of symptoms, fits in with the usual course of the Friedländer type of pneumonia. Most of the patients die within a few days, although a few develop abscesses and have recurrent attacks of pneumonia. We were unable to find an encapsulation of the fluid, although there were numerous old adhesions on the right side. The cause of the positive guaiac test on the stools was a small acute duodenal ulcer.

Dr. Sosman: That round shadow is the apex of the consolidated right lower lobe?

Dr. Castleman: I should think so.

Dr. Harwood: What did the ante-mortem culture show?

Dr. Castleman: Friedländer's bacillus, but growth had not occurred until after the patient's death. In retrospect, the organisms seen by the houseofficer were Friedländer's bacilli, which are gram negative, not pneumococci, which are gram positive.

Dr. Harwood: I had considered Friedländer's pneumonia because in that condition death is usually early and distention of the abdomen is a prominent feature, but ruled out the diagnosis because of the bacteriologic findings that were reported.

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PRESCRIPTION OF HEAVY CREAM

Last week the *Journal* took editorial notice of one of the more recent *causes célèbres* — Amendment 2 to War Food Order 13, emanating from the Office of Distribution of the War Food Administration. According to this amendment, medical prescriptions for heavy cream must be approved by the public-health officer or the secretary of the county medical society of the area where a patient or hospital is situated.

In Massachusetts, authority has been given to the district supervisor of the Office of Distribution to make a reasonable interpretation of the terms of the amendment, to the extent that not only will the broad purposes of the order be better served but practicing physicians will be relieved of the irritation of having their prescriptions subject to the endorsement of a variety of persons. The endorsing function has, by this interpretation, been vested in an advisory committee composed as follows: John H. Sullivan, district supervisor, Office of Distribution, War Food Administration, chairman; Dr. Vlado A. Getting, commissioner of public health, Commonwealth of Massachusetts; Dr. G. Lynde Gately, health commissioner, City of Boston; Dr. H. Quimby Gallupe, secretary, Board of Registration in Medicine; Dr. Nathaniel W. Faxon, director, Massachusetts General Hospital; and Drs. F. Gorham Brigham, Joseph Garland, Loring Grimes and Franklin W. White, representing the Massachusetts Medical Society.

Prescriptions, which are valid for a period not exceeding sixty days, should indicate the date of issuance, the butter-fat content required, the daily quantity required and the necessity of such cream for medical treatment, and should be forwarded to the War Food Administration, 404 Park Square Building, Boston. Telephone inquiries should also be directed to the Food Distribution Administration (LIBerty 7520).

It is apparent that few prescriptions will receive the endorsement of this committee in view of the overwhelming mass of evidence that cream in excess of 19 per cent butter fat is rarely, if ever, a necessity in medical treatment. Milk, in these critical days, needs to be conserved. One of the best ways of conserving it in order that we may have enough fluid and dried milk, butter, cheese and light cream, is practically to abolish, for the time being, the luxury of heavy cream.

An appeal to the patriotism of patients should be almost sufficient to eliminate the demand for heavy cream.

RED-CELL RESIDUES

The organization and rapid growth in the last three years of the Blood-Donor Service of the American Red Cross has been one of the miracles of this country's ability to produce for war. During the interval between the two world wars it became evident that restoration of blood volume with plasma

or serum was the *sine qua non* of the treatment of shock, and the large supply of plasma now available to our armed forces is the result of careful and long-sighted planning.

During the course of World War II interest has been aroused in some of the constituents of the blood other than plasma itself. This has been true of the red-cell residues following the removal of plasma from a blood donation. Soon after the organization of the Blood-Donor Service it became apparent that the loss of red-cell residues was a frank waste of an important part of the donor blood. Furthermore, as experience with war casualties grew, a need for the red-cell component of blood, as well as the plasma, became evident. Red cells have been supplied so far to our troops overseas by whole blood drawn for the purpose at the time and place it was to be used. The use of red-cell residues at the front has been limited by the poor storing qualities, so that even with air-borne transportation it has not been practical to use them.

Red-cell residues have been made available, however, to certain hospitals in the United States for civilian use. Taylor, Thalhimer, and Cooksey[1] report the administration of eighteen thousand transfusions using red-cell residues resuspended in physiologic saline solution. Their work has confirmed, on a much larger scale, the experience of many others who have in recent years shown that suspensions of red cells may, with certain limitations, be used in the treatment of anemia.

The red-cell suspensions so used furnish all the important elements for the replacement of erythrocytes. The chief advantage of their use is that the plasma is saved for other purposes. Another advantage is that, by suspending the erythrocytes in a smaller amount of fluid than that necessary to restore the original volume, a transfusion medium is made that contains less sodium chloride and more hemoglobin than a whole-blood transfusion. This procedure is particularly useful in patients with severe anemia and congestive cardiac failure, in whom it is urgently desirable to raise the hemoglobin and red-cell count and to reduce the blood volume and body salt. Red-cell suspensions made in this way, however, remain usable for a much shorter period of time than those resuspended to their original volume in physiologic saline solution or in one of the newer fluids.

The storage of red-cell suspensions has been studied for a number of years, but research has been greatly stimulated by the quantities now available as well as by the possibility that, with air-borne transportation, the cells might be used by the armed forces overseas if their life in storage could be prolonged. Investigators have been searching for the ideal resuspending fluid — one that would prevent increased fragility of the cells to hypotonic saline solutions, that could be given without fear of untoward reaction and that would, if possible, promote the longevity of the cells after administration. Solutions containing various combinations of electrolytes, and usually glucose, have been extensively studied regarding both the prevention of hemolysis in vitro and the duration of life of the cells in vivo. Denstedt et al.,[2] after much painstaking work, proposed a fluid containing 2.3 per cent glucose and 1.7 per cent sodium citrate, buffered to pH 7.4 with sodium phosphate. Using red cells tagged with radioactive iron, Ross[3] and others[4] have found that cells resuspended in Denstedt's fluid, or a similar mixture, can be stored for two weeks, or perhaps longer, with 80 to 90 per cent of the cells surviving for forty-eight hours after transfusion. Although further studies are necessary, this is an indication of the possibilities of the use of red-cell suspensions.

The separation of blood into its physiologically active components offers new opportunities for the blood bank of the future. One might think of each community with a blood-donor service prepared to supply whole blood, plasma, albumin, specific globulin fractions and erythrocyte suspensions. The proper use of such a service would require the cooperation of the physicians within the community, but the therapeutic possibilities are manifold.

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MASSACHUSETTS MEDICAL SOCIETY

COMMITTEE TO AID THE DISTRICT RATIONING OFFICER

Medical Responsibility in Food Rationing

The need for some system of food rationing made itself felt in the first year of war, when it became apparent that shortages of certain foods would give rise to inequalities of distribution and resultant hoarding, and might even cause their disappearance at times from the market. These shortages were due to two obvious causes—a tendency to decreased production as a result of insufficient labor and material, and an increased consumption because of the growth of the armed services and the demands of lend lease. On March 1, 1943, consequently, some months after sugar rationing had been put into effect, a point system of rationing for many meats, fats and processed foods was established.

Rationing under any circumstances is subject to difficulties: man is ever mindful of his own, and war always presents the contrasts of great sacrifices and great selfishness. In this country its difficulties are increased by the peculiarities of our national situation. We are a food-producing country, with a mixed population of diverse dietary habits. Sectional differences in food supply exist, making uniform rationing regulations inconsistent, and we have experienced, on the home front, an almost complete immunity to the perils of war.

Nevertheless, even with the relatively mild degree of food rationing to which we have so far been subjected, there was early recognized the possible need for special consideration of certain patients and institutions on account of health requirements, in order to safeguard in theory, and in practice so far as possible, the rights of all. Consequently in April, 1943, the director of the War Food Administration requested the National Research Council to appoint "a group of nationally known physicians to advise the War Food Administration concerning the extent of these special needs and the best method of meeting them."

The Subcommittee on Medical Food Requirements of the Committee on Drugs and Medical Supplies within the Division of Medical Sciences of the Council resulted. This committee studied the problem during the next few months, and published its report in the October 16 issue of the *Journal of the American Medical Association*.

The recommendations of this report form the basis on which departures from strict adherence to food rationing are made on medical grounds. They limit and interpret the list of conditions for which extra rations are allowable, and the quantities of extra rations allowed, yet guard against too strict an interpretation of their policies. Liberal interpretations may be made of the principles involved, but in order that the affairs of the public should be protected, it is further suggested that the flexibility of the program be vested in medical panels appointed to aid the state or regional rationing boards in the discharge of these particular duties.

Massachusetts, one of the first of the states to recognize the desirability of such an organization, responded with a committee appointed in June, 1943, by the president of the Massachusetts Medical Society at the request of the director of the State Office of Price Administration.

The recommendations of the subcommittee of the National Research Council, although published in October, 1943, and utilized since that time as a guide for procedure, were not accepted and put into effect by the Office of Price Administration until March 30, 1944. These recommendations, in substance, permit extra rations within qualitative and quantitative limitations for the following conditions: diabetes mellitus, active tuberculosis, chronic nephritis of the nephrotic type, cirrhosis of the liver, severe hepatitis, chronic suppurative diseases, burns, gastrointestinal lesions and pregnancy. As has been stated, these recommendations may require liberal interpretation.

Certain fundamental difficulties soon become apparent in any effort to establish a program for supplying extra rations for the sick. The need for rationed foods must obviously depend on the availability of nonrationed foods, not only as regards their actual scarcity, but also as regards their expense and their nutritional substitution value for rationed foods, due consideration being given to seasonal and geographical variations in their supply.

Since point values vary on different forms of rationed foods even inside the various groups and classes, the availability of rationed foods must also be considered in terms of local conditions of supply and demand, prices and number of ration books in a family. A person has much greater difficulty in constructing an adequate diet with one ration book, than does the marketer for a family that can pool a number of ration books in buying on a quantity basis. The frequent shifting of point values on rationed foods, depending on their nationwide availability, also creates problems that make any rigid allowances inaccurate and often inconsistent with the needs of the case.

These difficulties are implicit in the very nature of food rationing and are due largely to its elasticity — an elasticity that is vitally necessary if rationing is to be just but one requiring an equal elasticity in its modifications.

Still more fundamental are the differences in nutritional needs of various patients and in our interpretations of these needs. Regardless of disease diagnoses, the needs of no two persons are precisely alike and it is patently as absurd, except in a very general way, to try and fit with the same diet subjects of varying physical conditions and dimensions, activities, ages, sex, emotional backgrounds,

dietary habits and racial peculiarities as it was for Procrustes to try and fit his unhappy lodgers into his single bed of fixed dimensions. Moreover, despite the prodigious advances that have been made in our knowledge of the role of diet in health and disease since Captain Cook first demonstrated the need of fresh foods on an ocean voyage, our information regarding the specific role of diet in many diseases can scarcely be considered mathematical.

With this inexactness of knowledge, there are still permissible wide variations in the views of individual physicians regarding the part that diet may play in the treatment of certain diseases, and it is frequently on the statements of these physicians that judgments must be made on the allotments requested for individual cases, in order to do justice to both the patient and the public. It must be recognized, too, that few physicians can have the information on food values and their seasonal irregularities that would be necessary for an accurate month-by-month appraisal of their patients' needs.

Strictness in the interpretation of regulations applying to extra rations must also be a variable factor, depending on the month-by-month needs of rationing. We must also bear in mind that few patients actually require more food or different food than can be obtained from their basic allotments and point-free foods, that many average-sized families do not find it necessary to use up their basic allotments, and that many active medical practitioners rarely, if ever, find it necessary to prescribe extra food allotments for their patients.

The committee appointed in this state to aid the district rationing executive had little in the way of precedent to help it in its early deliberations. After consulting authorities in various fields of medicine, however, it was decided to accept as a reasonable maximum for any diagnosis the allotments of rationed foods that had been determined as a reasonable maximum for patients with diabetes, namely, 4 pounds of processed foods and 5 pounds of meats and fats per week. These amounts include the basic rations, but do not include unrationed foods. As later developments showed, this allotment compares favorably with the diets recommended for diabetes and other diseases by the subcommittee of the National Research Council. A smaller allotment (2 pounds of processed foods and 3 pounds of meats and fats per week) was later adopted and allowed where need seemed to exist in conditions not accepted by the subcommittee of the National Research Council or where any doubt existed concerning the needs of the patient. When point values were removed from many meats these allowances were halved for meats and fats, and are continually subject to revision as conditions change.

The impossibility of attaining mathematical accuracy in the task of attempting to temper the wind to the shorn lamb has been indicated. The best that any advisory group can do is to profit by its own experience, to try and keep abreast of changes and improve its methods of administration in a field where so little exact knowledge exists, and to insist on continuous flexibility of a program that deals with so many variable factors.

Figures at present available indicate that approximately 13,500 persons in Massachusetts are receiving supplemental rations, or 0.3 per cent of the population. This does not seem to be an unduly high figure, but it does suggest a considerably greater number who have sought and failed to receive extra allotments. These requests are made for a variety of conditions, some of which are patently unsuited to dietary treatment, and others of which could not reasonably be expected to benefit from it according to accepted standards of treatment; they are made not infrequently for gargantuan quantities of food, the ingestion of which some patients could hardly be expected to survive.

Success in the limitation of extra allotments of food to those relatively few persons who absolutely require it must depend in large measure on the knowledge and integrity of practicing physicians. Admitting differences in methods of treatment and in the patients treated, and taking into consideration the limitations of our knowledge, we believe nevertheless that the restrictions as established are fair ones.

It would help the committee if the physicians' statements in requesting extra food were fuller and more accurate. This would avoid long delays for the patient, occasioned by asking for further information from the doctor. For example, the committee needs more exact diagnoses: not simply "anemia" but the kind and severity; not simply "hematemesis," but the date and the existing level of the hemoglobin; not simply "operation," but the date and kind. It still seems as if the number of requests for extra food was far too high and could be greatly lessened if the doctor would look at his patient more critically and ask himself if the extra ration is really a medical necessity in cases such as hemiplegia, "rheumatism," concussion, skin disease, psychoneurosis, angina, ptosis, asthenia, Parkinson's disease, irritable colon, heart disease and so forth.

The work of the advisory committee will be further expedited as information concerning its activities becomes more general. For months it has been found necessary to enlist its aid in the rationing problems of the other New England states except Rhode Island, due to the absence of committees in these states. It will be able to do its work more effectively when relieved of these burdens, and when local committees are established, as is now planned, to work in conjunction with the rationing boards in various key cities.

JOSEPH GARLAND, *Chairman*

(*Notices on page xiii*)